

The Solution Designer's Guide to IBM On Demand Business Solutions

Preparation for IBM solution designer certification

On Demand Business solution design basics

Solution design tips and techniques



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**The Solution Designer's Guide to IBM On Demand
Business Solutions**

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Note: Before using this information and the product it supports, read the information in “Notices” on page ix.

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This edition applies to IBM's On Demand Business strategy and how to design solutions that support it.

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Preface

In a few short years, On Demand Business has gone from a simple concept to an undeniable reality, and for good reason. It works for everyone: consumers, businesses, and governments.

This IBM® Redbook addresses the topic of designing the On Demand Business solutions that have become so central to our clients' business success. It is intended to be a resource – but not a prerequisite - for the technical professional who is preparing to take Test 817, IBM Certified for On Demand Business - Solution Designer.

This publication offers sample test questions for Test 817. The information provided is designed to help the reader prepare for the test, including helpful tips for taking it.

Beyond being a reference for Test 817, this redbook will be helpful to understand the IBM On Demand Business strategy and to design solutions that support it. The redbook helps you design On Demand Business solutions using proven methodologies and patterns, explains key On Demand Business concepts and technologies, describes what the On Demand Business solution design process entails, and shares experiences that others have had designing On Demand Business solutions. It also provides information about resources and tools related to On Demand Business solution design.

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Part 1

Solution Designer fundamentals

This part provides essential information about Solution Designer certification, the Solution Designer's role, and On Demand Business. It contains the following chapters.

- ▶ Chapter 1, "Start here for Solution Designer On Demand Business certification" on page 3
- ▶ Chapter 2, "What Solution Designers should know about IBM's offering for On Demand Business" on page 15
- ▶ Chapter 3, "The Solution Designer's role" on page 23



Start here for Solution Designer On Demand Business certification

This chapter provides a good starting point for anyone who wants to become an IBM Certified on Demand Business Solution Designer.

It introduces the IBM for On Demand Business Initiative and provides test objectives, sample test questions, and answers for Test 817, IBM Certified for On Demand Business - Solution Designer.

Good luck to you on your certification journey!

1.1 The IBM Certified for On Demand Business Initiative

To successfully build an On Demand Business, organizations need access to highly skilled professionals to help them establish an On Demand Business vision, transform their business processes, and implement changes.

The IBM Certified for On Demand Business Initiative is designed to increase and validate a sales and IT Professional's On Demand Business proficiency, beginning with two key certified for On Demand Business roles: Solution Advisor and Solution Designer. These certifications focus on the key capabilities required to develop an On Demand Business strategy, select specific technologies and products, design an implementable solution, and implement and maintain that solution.

At the Business Partner Firm level, the IBM Certified for On Demand Business Accredited - Business Partner designation is granted to Business Partners who have demonstrated an investment in skilled On Demand Business professionals and have a documented strategy for how they will address the On Demand Business opportunity. These firms will be marketed and differentiated as the key 'go to Business Partners' for On Demand Business sales.

1.1.1 Target audience and value proposition

This initiative provides clients a comprehensive On Demand Business value chain by bringing together business professionals, business partners, and IBM process and technology solutions to respond to client's dynamic requirements. The target audience includes:

- ▶ **Business Partners:** For IBM Business Partners who seek to profit from new opportunities in On Demand Business, IBM Firm Accreditation delivers the chance to differentiate their companies and grow their businesses. This accreditation will provide visibility and proof of a company's On Demand Business expertise and partnership with IBM as a proven leader, committed to growing On Demand Business. Through the firm accreditation initiative, Business Partners demonstrate they are true leaders with IBM in capturing market share in this evolving world of dynamic computing, and will be marketed to the IBM teams as the key 'go to' Business Partners for selling On Demand Business solutions. Advanced and Premier Business Partners who demonstrate an investment in On Demand Business skills and who have a documented marketing plan will be provided usage of the 'On Demand Business' identity mark, and be provided additional On Demand Business promotional communication and marketing benefits.
- ▶ **IBMers and IT Professionals:** For IBMers and IT Professionals who seek to more effectively differentiate their skills in On Demand Business selling, the On Demand Business Certifications can provide the competitive advantage that validates the idea that a sales professional has the right skill set to engage clients, develop effective On Demand Business strategies, and translate clients' requirements into viable opportunities. Individuals who attain On Demand Business certification will be provided the On Demand Business mark, which is a value add differentiation from their peers.
- ▶ **Clients:** The On Demand Business certifications provide clients with a highly qualified pool of skilled resources familiar with IBM's leadership in On Demand Business technology and solutions. These skilled advisors provide capabilities that will allow clients to solve key business issues through solutions that are responsive and integrated.

The IBM Certified for On Demand Business Initiative is designed to increase a sales and IT professional's On Demand Business proficiency, beginning with two key certified for On Demand Business roles: Solution Advisor and Solution Designer. These certifications will focus on the key capabilities required to develop an On Demand Business strategy, select specific technologies and products, design an implementable solution, and implement and maintain that solution.

When you become certified as an On Demand Business Solution Advisor or Solution Designer, you differentiate yourself as a trusted advisor, which will help you lead your company or your clients through their transformation into becoming a fully integrated On Demand Business.

The training and testing required for these certifications can help you:

- ▶ Identify potential clients for On Demand Business solutions
- ▶ Facilitate the creation of the buying vision
- ▶ Acquire proven skills to differentiate yourself in a competitive environment
- ▶ Enhance your earning potential and the possibilities of career advancement

You will also be better prepared to contribute to your company's success! Whether your company is considering ways to become an On Demand Business, or is an IBM Business Partner advising other companies, On Demand Business professional certification for individuals creates a solid foundation to help your company:

- ▶ Differentiate itself among competitors
- ▶ Strengthen business ties to IBM and open new marketing opportunities
- ▶ More effectively map technology to business value
- ▶ Benefit from the valuable experience and proven best practices that others have gained from implementing On Demand Business solutions
- ▶ Meet the skills requirements of the IBM PartnerWorld program

1.1.2 Solution Advisor

The Solution Advisor certification validates the ability to engage clients, develop an On Demand Business strategic vision, translate client requirements into On Demand Business opportunities, and manage the client relationship. It is applicable to anyone selling IBM solutions to help clients become an On Demand Business. The Solution Advisor is responsible for:

- ▶ Identifying potential clients for On Demand Business
- ▶ Building client relationships
- ▶ Identifying client business problems and requirements
- ▶ Facilitating the creation of the buying vision
- ▶ Articulating the IBM value proposition
- ▶ Orchestrating solution development

To obtain the role IBM Certified for On Demand Business - Solution Advisor, you must pass Test # 816, IBM On Demand Business Solutions Sales.

The link below will provide access to the Solution Advisor Certification roadmap, which can be reviewed in more detail. By clicking on any underlined content, the user will be directed to the education being referenced.

http://www-1.ibm.com/partnerworld/pwhome.nsf/weblook/tac_sel_startebod_011604.html

The redbook *Selling Solutions for On Demand Business*, SG24-6330 is available as a study guide for those preparing to become IBM Certified Solution Advisors. A PDF can be downloaded from the following URL:

<http://www.redbooks.ibm.com/abstracts/sg246330.html?Open>

1.1.3 Solution Designer

The Solution Designer certification validates the ability to translate client business requirements into implementable On Demand Business solutions. It takes security, networking, and existing client environments to design a secure scalable solution into consideration. This certification is for those with general IT consulting or architecting experience.

The Solution Designer is skilled at articulating industry and technology trends within the framework of the IBM On Demand Business strategy, including:

- ▶ Gathering and evaluating client business requirements
- ▶ Identifying and documenting current processes and infrastructure related to the business requirements
- ▶ Designing an On Demand Business solution
- ▶ Validating the On Demand Business design
- ▶ Presenting the solution to the client
- ▶ Assisting the project management team with implementation and deployment

It is expected that the On Demand Business - Solution Designer will be essentially self sufficient and require minimal assistance from peers and vendor support personnel.

To obtain the role IBM Certified for On Demand Business - Solution Designer, you must pass Test 817, IBM Certified for On Demand Business - Solution Designer.

1.2 Solution Designer Certification Test: objectives

Test 817, IBM Certified for On Demand Business - Solution Designer is designed to assess the candidate's ability to design an implementable On Demand Business solution that meets client business requirements. It tests skills in the following areas:

- ▶ Gather and evaluate client business requirements
 - Determine what business goals the client is trying to achieve
 - Identify information that needs to be gathered to understand business requirements
 - Identify critical design factors (that is, extensibility, manageability, scalability, availability, and so on).
 - Identify the client's budget/time/resource constraints
 - Identify the client's long-term objectives/strategies
 - Identify the client's business policies and rules
- ▶ Identify and document current processes and the infrastructure related to the business requirements
 - Identify the critical as-is and desired processes and determine the gaps
 - Identify the relationship between a client's processes and infrastructure and the potential solution designs
 - Recommend business process optimization as dictated by client requirements
 - Determine the potential impact of existing processes and infrastructure on possible solution designs
 - Determine the appropriateness of an On Demand Business solution based on client requirements, processes, and infrastructure

- Verify and document the existing infrastructure
- ▶ Design an On Demand Business solution
 - Follow industry accepted principles for solution design (that is, best practices, methodologies, and architectural approaches)
 - Evaluate and select patterns based on client requirements
 - Identify and evaluate solution options to finalize an approach
 - Assemble components into a functional On Demand Business solution based on business requirements
 - Identify and evaluate solution component options
 - Incorporate ease-of-use requirements into the solution design
 - Create a projection of the return on investment (ROI) and Total Cost of Ownership (TCO) of the solution.
- ▶ Validate the On Demand Business design
 - Validate that the solution design meets functional requirements
 - Validate that the design meets non-functional requirements
 - Validate that the solution design meets quality of service and SLAs
 - Validate that the design functions within the client's infrastructure
 - Validate that the design functions within the client's business processes
 - Validate that the solution moves the client further along the On Demand Business continuum
 - Validate that the solution design meets the client's long-term requirements
 - Participate in a Solution Assurance Review
- ▶ Present the solution to the client
 - Tailor a presentation to the client audience (that is, business, IT, and so on)
 - Use appropriate delivery methods to present the solution (that is, demos, proof of concepts, and so on)
 - Provide design-related evidence for ROI and TCO of the solution
 - Address client feedback regarding the design
- ▶ Assist the project management team with implementation and deployment
 - Engage relevant services/resources to deploy the solution
 - Provide guidance on project calls or meetings
 - Provide input into the cost, time, and resource estimates

1.3 Solution Designer Certification: sample test questions

Presented here is a sample test for Test 817, IBM Certified for On Demand Business - Solution Designer. Use this set of sample questions not so much as a study guide, but rather to get a good feeling for the scope and nature of the test questions. The real Test 817 questions will largely use the same terminology and look and feel.

The following are some basic guidelines that we used when constructing the test questions. This will allow you to focus on the content of the test questions rather than the mechanics of the test process.

- ▶ Take the time to study the roles and responsibilities of the Solution Designer that we describe in Chapter 3, “The Solution Designer’s role” on page 23. This, more than anything, defines the boundaries of the questions you will find in Test 817, IBM Certified for On Demand Business - Solution Designer.
- ▶ Always answer with the best answer or answers. As is common, sometimes any answer could be made “correct” with enough caveats and dependencies. Focus on the root issues within the question to determine which is the *best* answer.
- ▶ If the question has two or more correct answers, it will be clearly indicated as part of the question. For example, the question, “In which *two* ways should the Solution Designer work with the project manager and project sponsors to handle this situation? (*Select two*)”, will tell you twice (emphasis has been added for this example; no emphasis will be seen in the sample or real test) that you should select the two correct answers. In addition, the test tool (generally a specialized PC application) will enforce the correct number of answers.

1.3.1 Sample Test 817 questions

See 1.3.2, “Answer key” on page 13 for the answers to this sample test.

1. An online auction company is expanding due to its growing popularity and financial success over the past two years. Although the CEO is excited about the growth, he is a little bit skeptical on whether the IT infrastructure can withstand the growth. The CEO wants to guarantee 99% uptime and excellent response time for their clients. He also wants the business to be very responsive and adaptable to current and future competitive threats.

Due to the rising popularity of this auction company brand, there is a growing concern on how to effectively collaborate and work with an ever increasing number of partners, suppliers, sellers, and clients. The CEO also has a vision of entering into new, non-traditional auction markets, such as travel, vacation packages, resorts, and time shares. The CEO wants to accomplish the business goals within the current operating budget and with a short timeline. The CIO has proposed a completely brand new infrastructure solution from a key vendor that shows promise, but is unproven and may impact the budget. The CEO wants to ensure the greatest end-user experience for his clients.

Recently, due to capacity issues, there have been multiple server outages. The outages seriously impacted client satisfaction and ultimately affected revenue. Also, there have been client authentication issues and an attempted hack of one their non-critical intranet computers.

According to the CEO, which of the following is a business goal?

- a. Capture business knowledge, reduce duplication of information, and unify view of information across the web site.
- b. Ensure reliability and security of the web site, and improve the scalability of the IT infrastructure.

- c. Get an internal system integration solution that will increase IT infrastructure availability and security.
 - d. Revamp the current infrastructure to increase employee productivity and enable IT to respond to complaints.
2. A specialty retailer has a call center that supports all its sales channels (in-store purchases, internet purchases, and catalog orders). The Merchandising group produces the catalog, and the MIS group maintains the databases that support the call center. Sometimes when clients phone the call center referencing Product IDs in the current catalog for the items they want to order, they are told that these items are not showing up on the screens at the call center. Such clients are politely rejected, and the company therefore loses that business opportunity. A Solution Designer has been brought in to help solve the problem.

Which of the following is the first action the Solution Designer should take?

- a. Review the product databases for the retailer.
 - b. Review the company's product ID management process.
 - c. Review the company's merchandising process.
 - d. Review the company's catalog drops.
3. A Solution Designer is gathering the Service Level Agreement (SLA) requirements for an application. Which of the following is the most important component of an effective SLA?
- a. Expected performance.
 - b. Measured statistics.
 - c. Status reports.
 - d. Procedure for project staff changes.
4. An online auction company is expanding due to its growing popularity and financial success in the past two years. Although the CEO is excited about the growth, he is skeptical as to whether his infrastructure will be able to withstand it. Due to the large volume of business conducted via their site, the CEO wants to guarantee 99% uptime and excellent response time for their clients. In addition, he wants the business to be very responsive and adaptable to current and future competitive and security threats.

What would be the key business constraint that the Solution Designer will need to consider before designing a solution?

- a. The growing list of users, partners, sellers, and clients.
 - b. Vulnerability of servers.
 - c. Budget limitations.
 - d. Server hardware availability.
5. A Solution Designer is scheduled to interview a CIO of a financial institution to gather requirements for a potential On Demand Business solution. What is the most appropriate question that the Solution Designer should ask in order to determine the client's long-term vision?
- a. Which initiatives are planned or are in progress?
 - b. What are your strategic business initiatives?
 - c. How satisfied are you with the current system and infrastructure?
 - d. What are your operational capabilities?

6. A large consumer products company is facing significant increases in travel expenditures for employees in many of its divisions. Different departments enforce their own policies and use different travel booking methods. Company management has reviewed the current policies and decided to discard current travel policies in favor of new, consolidated policies. They also want to use standard methods to control costs and negotiate better contracts with suppliers. How will the Solution Designer begin to help the client design the new system?
 - a. Determine employee access requirements and new interfaces with the suppliers.
 - b. Gather the new travel policies and standard methods to translate them into business and design rules for the new system.
 - c. Identify the IT requirements for the new system by documenting the existing infrastructure and its impact on the new design.
 - d. Identify and implement cost control procedures to help fund the re-design of the travel policy system.
7. What are the three main defined areas that virtualization addresses in real client problems?
 - a. Ease-of-use, flexibility, and security.
 - b. Flexibility, ease-of-use, and cost savings.
 - c. Cost savings, efficiency, and security.
 - d. Cost savings, efficiency, and flexibility.
8. An On Demand Business solution is soon to be deployed that will involve replicating a database across disparate hardware platforms through the use of virtualization. The Solution Designer is assisting the project manager in identifying the needed implementation resources for this project. Which of the following is the most relevant skill set that would be needed?
 - a. Network administrator.
 - b. Database administrator.
 - c. Storage administrator.
 - d. Systems administrator.
9. The role of the On Demand Business Solution Designer includes supporting the project management team with the solution implementation and deployment to ensure success. Which of the following tasks is the most appropriate for the On Demand Business Solution Designer during this phase?
 - a. Elaborate on the Statement of Work to ensure that it meets the technical specifications.
 - b. Define the acceptance test criteria for the designed solution.
 - c. Assist with establishing acceptance criteria and project endpoint.
 - d. Provide an effective risk management methodology.
10. Which tools and techniques are typically used in the scope planning process to quantify cost, time, and resource estimates?
 - a. Analysis of the product, cost/benefit analysis estimates, identification of alternative approaches, and expert judgment.
 - b. Breakdown of major tasks and decomposition of deliverables into more manageable units.
 - c. Review of historical information, creation of project constraints and assumptions, and cost/benefit analysis projection.

- d. Project justification, work breakdown structure templates, and identification of alternative approaches.
11. After presenting an On Demand Business design to the client, there are major concerns about the architecture of the solution. Which of the following actions will best address these concerns?
- a. Conduct a Solutions Assurance Review (SAR).
 - b. Analyze use cases and map all the concerns with the proposed On Demand Business architecture.
 - c. Create and show a small-scale working prototype.
 - d. Review the conditions of satisfaction.
12. The Solution Designer has proposed an On Demand Business solution to streamline the business processes based on Service-oriented Architecture using open standards, such as BPEL and XML. Taking into consideration the nature of data that is collected and transacted by the mortgage company, which of the following On Demand Operating Environment capabilities must be a part of this solution?
- a. Resource Virtualization.
 - b. Security.
 - c. Provisioning.
 - d. Business Intelligence.
13. Which of the following is recognized as a standard for defining the meta-data by Object Management Group (OMG)?
- a. Meta-Object facility (MOF).
 - b. XML Meta-data Interchange (XMI).
 - c. Unified Modeling Language (UML).
 - d. Common Warehouse Metamodel (CWM).
14. A Solution Designer has been assigned to design an On Demand Business solution focusing on business process integration. The Solution Designer has decided to use an On Demand Operating Environment solution to address this integration goal. Which of the following On Demand Operating Environment Integration capabilities would help the Designer arrive at an On Demand Business solution?
- a. Business Modeling, Process Transformation, Virtualization, Scalability, Security, and Business Process Management.
 - b. Business Modeling, Process Transformation, Application and Information Integration, Access, Collaboration, and Business Process Management.
 - c. Business Modeling, Process Transformation, Application and Information Integration, Infrastructure Orchestration, Provisioning, and Scalability.
 - d. Business Modeling, Availability, Business Process Management, Infrastructure Orchestration, Security, and Provisioning.

15. A Solution Designer is working on an information integration On Demand Business solution. The two approaches that are being considered include: Data Federation and Data Consolidation. Which one of the following would make Data Federation the preferred choice?
- a. Real time or near real time access to rapidly changing data is required.
 - b. Needed data transformations or joins are complex or long running.
 - c. Access to reasonably stable data is required.
 - d. The cost of copying data is significantly lower than that of accessing it remotely.
16. What are the components of availability in the framework of infrastructure management in an On Demand Operating Environment?
- a. Application provisioning, identity management, and transaction management.
 - b. Transaction management, event management, root cause analysis, and Dynamic Sense & Respond.
 - c. Root cause analysis, self-managing infrastructure, and dynamic virtualization.
 - d. Monitoring, event management, and automatic correction.
17. A large banking client is looking for a solution that will accelerate application development and link business requirements, abstract models, and artifacts to the final solution. What is the recommended method that will meet the client's needs?
- a. Infrastructure prototyping.
 - b. Model Driven Development.
 - c. Extreme programming.
 - d. Object-Oriented programming.
18. The CIO of an online retail company asked the Solution Designer to prove that the current solution will help them transform their business to be an On Demand Business. Which of the following actions is the best approach to address the CIO's concern?
- a. Use the On Demand Business Adoption Method to position where the current project is in their business transformation.
 - b. Demonstrate to the CIO that one or more On Demand Business capabilities have been included in the solution.
 - c. Demonstrate how the solution meets one more of the characteristics of an On Demand Business.
 - d. Use the outcome of the On Demand Business validation method to validate how the current project moves the client further along the On Demand Business continuum.
19. Which tool should a Solution Designer use to map a client's business initiatives and provide them with a projection of the total cost of ownership for the current On Demand Business project?
- a. Competitive Advisor
 - b. TCONow!
 - c. Profiler for On Demand Business
 - d. Automation Assessment Tool

1.3.2 Answer key

Here are the answers for the sample test questions.

1. B
2. B
3. A
4. C
5. B
6. B
7. D
8. C
9. C
10. B
11. A
12. B
13. A
14. B
15. C
16. B
17. B
18. A
19. C



What Solution Designers should know about IBM's offering for On Demand Business

This chapter provides a thumbnail sketch of IBM's offering for On Demand Business and what you should know about it. The following topics are addressed:

- ▶ What is IBM's definition of On Demand Business
- ▶ How does On Demand Business differ from e-business
- ▶ How becoming on demand will change a business
- ▶ Who is using On Demand Business today
- ▶ Where does a business start in becoming an On Demand Business?
- ▶ What is business transformation?
- ▶ What is the On Demand Operating Environment (ODOE)?
- ▶ What IBM techniques are available for getting started with On Demand Business?

2.1 IBM's definition of On Demand Business

An On Demand Business is an enterprise whose business processes - integrated end-to-end across the company and with key partners, suppliers and clients - can respond with speed to any client demand, market opportunity, or external threat.

In a nutshell, an On Demand Business is about:

- ▶ Leveraging technology to enable organizations to achieve tremendous flexibility and adaptability to client demand, market opportunity, and external threats in real time
- ▶ Being able to connect people, processes, and information with ease
- ▶ Streamlining and integrating processes seamlessly and securely; not only within the business, but among business partners, vendors, and clients
- ▶ Infrastructure simplification with efficient monitoring, management, provisioning, and virtualization capabilities
- ▶ Increasing throughput by utilizing existing assets, capabilities, and infrastructure to the maximum
- ▶ Leveraging industry standards-based computing models to achieve the above objectives

2.2 How On Demand Business differs from e-business

In the late 1990s, when internet usage became popular, organizations started using the Internet as a mechanism for connecting businesses to consumers and to other businesses. Suddenly, even distant businesses became as convenient as a few mouse clicks away. Even small, very specialized businesses that otherwise would have struggled gained a large client base and began to thrive. These types of businesses came to be known as e-businesses (the prefix 'e' denotes that the business is enabled by the internet).

As the technology matured, internet based technologies enabled organizations to connect their businesses directly to their clients, employees, suppliers, distributors, and business partners. They transformed traditional business processes with e-business applications and breathed new life into concepts such as supply chain management.

Internet technology is one of the main driving factors for e-businesses; many e-business models emerged during the dot.com era; as a result, the word "e" has technological connotations.

While e-business enabled organizations to connect entities, it did not address many challenges that organizations have to face in today's world: continuous changes (such as a sharp increase or decrease in demand), rigorous competition, financial pressures, and unpredictable threats.

On Demand Business differs from e-business because the choice of technology is only part of the equation. At its heart is the point at which technology and business models intersect with each other to unleash new capabilities and client experiences.

2.3 How becoming on demand changes a business

The process of transforming a traditional business into an On Demand Business means architecting your business to accommodate change. Ultimately, On Demand Business is all about servicing the client with the product they need, when they need it. The client may be another business, a business partner, or even departments within the business itself. The following are examples of how becoming on demand could change, or has changed, several businesses.

Cable news

Information overload is as frustrating as not being able to get the information you want when you need it. As an example, though cable news is informative, it is a blunt instrument aimed at the masses. On Demand Business transforms such a blunt instrument into a precision tool. Rather than broadcasting traffic conditions to people that are most likely at home eating dinner, imagine that while you are driving down the road, your car automatically downloads those traffic conditions to your GPS via satellite, thus providing you with the information you need when you need it.

Grocery

In today's world, being able to track a package that is in transit is a luxury that we have come to expect. Though RFID (Radio Frequency Identification) has been dubbed "The New Barcode", the On Demand Business opportunities that are inherent in RFID reach far beyond the capabilities of the traditional barcode. Imagine that when a client removes one of the last ten items from the shelf of a grocery store, the inventory system is automatically updated and a replenishment order is placed with the appropriate supplier.

Automotive

Car manufacturers often recall their cars due to a defect associated with a specific part. RFID would enable those same manufacturers to identify the specific plant where the part was manufactured, and then generate a list of the car owners or dealerships where each car physically resides.

Financial services

E*TRADE is one of many IBM clients that benefits from IBM's On Demand business server related services. In the world of financial services, time is money. For example, E*TRADE Securities guarantees it will execute trades in two seconds or less. The industry average is five seconds. When E*TRADE FINANCIAL was looking to upgrade the technology that powered their online offerings, they turned to IBM. With over four million client accounts, E*TRADE's success depended on its ability to provide superb client service. They also required a scalable system that could handle unpredictable usage peaks and valleys. With a solution built on IBM @server® xSeries® servers running Linux®, E*TRADE has sharply reduced software licensing fees and service costs and enjoys flexibility in the applications they choose to deploy.¹

¹ http://www-306.ibm.com/e-business/ondemand/us/overview/howtheydidit/howtheydidit_flat.shtml

2.4 Who is using On Demand Business today?

On Demand Business is being used by businesses that are looking to drive productivity, innovate or explore, reduce costs, profit, or perform in a way that meets the ever changing demands of today's markets. It is used by businesses all over the world. It has benefited all businesses regardless of their size.

To find a sample list of organizations that are using On Demand Business to their advantage, please refer to the Web links in Chapter 14, "Resources and tools for On Demand Business solution design" on page 261. You can browse the businesses by industry, name, or using other categories. The case studies illustrate why and how they use on demand.

2.5 Where does a business start in becoming an On Demand Business?

The good news is that there is a clear cut, step-by-step roadmap for becoming an On Demand Business. As shown in Figure 2-1, you can begin an On Demand Business journey from a business transformation standpoint, or from the On Demand Operating Environment.

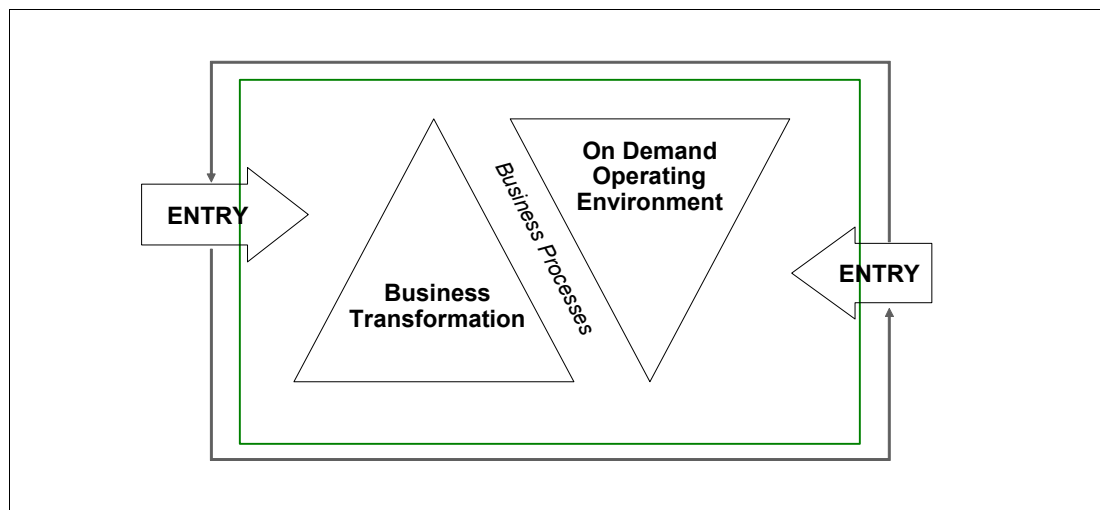


Figure 2-1 Starting points for On Demand Business

2.6 What is business transformation?

Business transformation in basic terms is about acquiring or enhancing business capabilities through new levels of integration between processes and technology. New or enhanced business capabilities can be realized by fundamentally improving or streamlining the current business processes. From the IT perspective, the level of integration is much broader, requiring horizontal business integration as opposed to point to point connectivity between application components and application integration. The transformation itself could be done within one organizational unit of an enterprise, within an entire enterprise, or across enterprises between an enterprise and its partners, suppliers, and clients. The key to On Demand Business transformation is taking an approach that is always business process-centric rather than IT Architecture or application-centric.

Business transformation also means reusing existing IT assets in a completely new way to achieve new business results. A business can become an On Demand Business if it can transform its core processes to be more focused and resilient.

Chapter 4, “Business transformation” on page 51 contains information about beginning an On Demand Business journey from a business transformation perspective.

2.7 What is the On Demand Operating Environment (ODOE)?

The On Demand Operating Environment (ODOE) defines a set of integration and infrastructure management capabilities you can use in an incremental and modular fashion to become an On Demand Business.

ODOE leverages existing key assets, including people, process, and infrastructure, so this is not a ‘rip and replace’ solution. ODOE gets the most out of current resources to transform a business to be more resilient and adaptive at the same time.

2.7.1 On Demand Operating Environment capabilities

Figure 2-2 shows a high level view of IBM’s On Demand Operating Environment capabilities. This structure is used to organize the information about ODOE presented in Chapter 7, “On Demand Operating Environment: the infrastructure management capabilities” on page 85 and Chapter 8, “On Demand Operating Environment: architectural elements” on page 117.

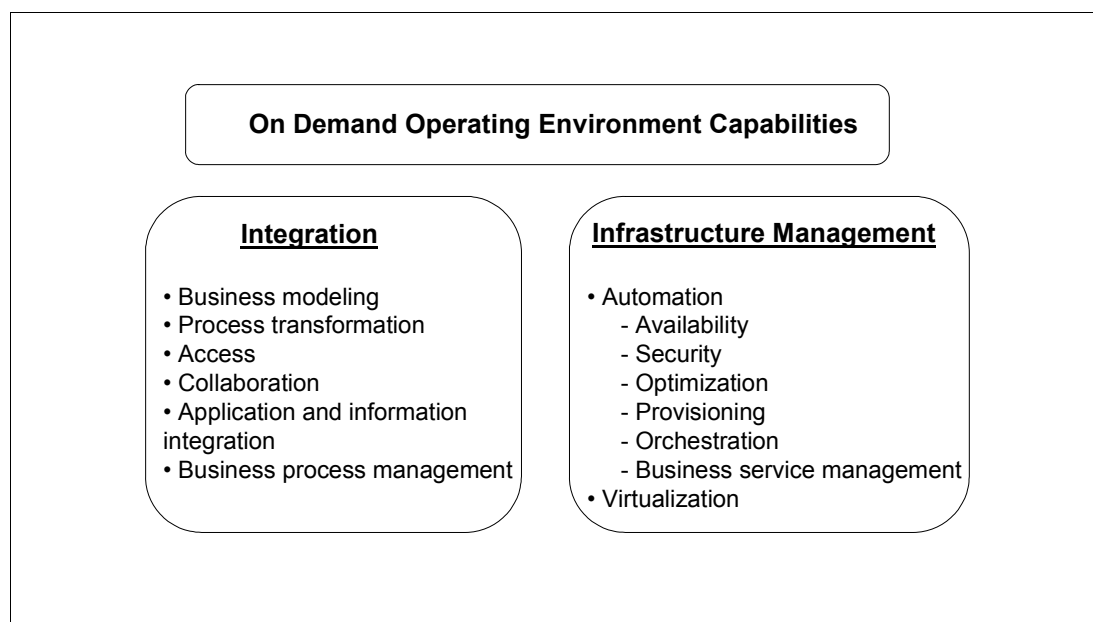


Figure 2-2 On Demand Operating Environment capabilities

An On Demand Operating Environment is more than a combination of products, a platform, or an architecture. As shown in Figure 2-3 on page 20, it is an approach designed to enable the business flexibility and IT simplification clients needed in order to become an On Demand Business. IBM has learned by working with clients what it takes to create the kind of infrastructure that enables an On Demand Business. An On Demand Operating Environment is based on open standards, so it can leverage the client's assets in their heterogeneous infrastructure. As shown in Figure 2-3 on page 20, IBM groups clients' concerns into two broad groups: business flexibility and IT simplification. Business flexibility is addressed by the

integration capabilities of ODOE. IT simplification is addressed by the infrastructure management ODOE capabilities.

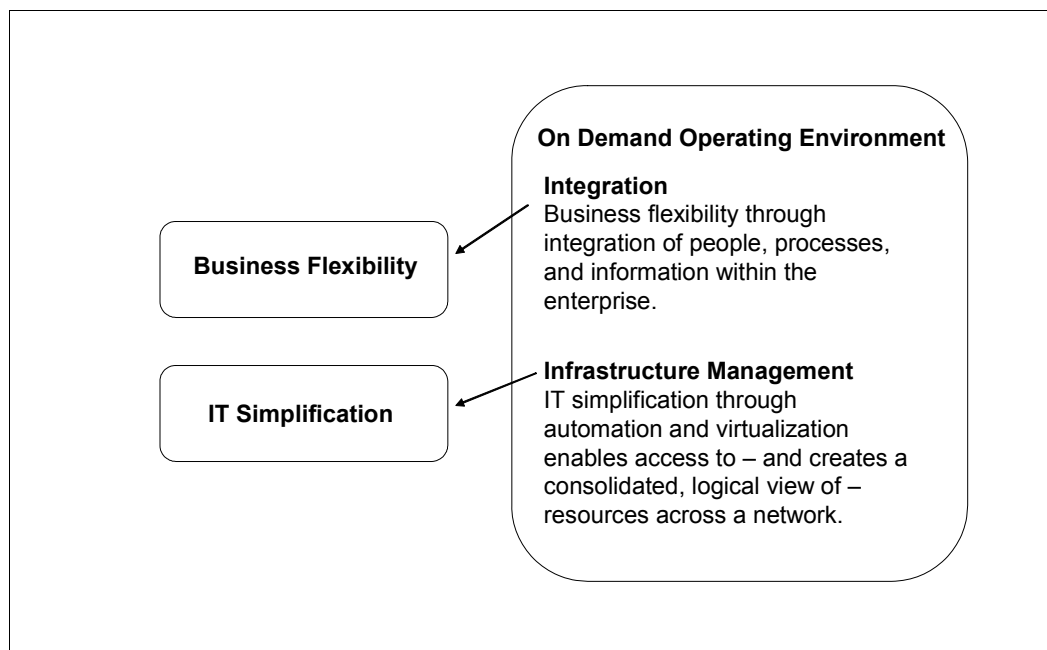


Figure 2-3 ODOE enables business flexibility (through integration) and IT simplification (through infrastructure management)

The design of an On Demand Operating Environment must also match the design of the business itself. Proprietary software must evolve to standards based infrastructure that can optimize the entire organization. The operating environment must enable efficient and flexible integration of people, processes, and information to optimize operations across and beyond the enterprise. Also, it must be resilient and easy to manage.

Because the On Demand Business computing model is based on industry standards, it can be used to define the business applications and systems at various levels: within a department, across the enterprise, or throughout an industry ecosystem. Consequently, it enables true end-to-end business process integration.

The On Demand Operating Environment looks at a set of technology capabilities that support a more flexible business design and simplifies the IT infrastructure. Our solutions leverage existing assets, enable integration, and match the infrastructure design to the business design.

Businesses continue to look for ways to overcome new and existing challenges. They develop new strategies, look for ways to innovate, drive to increase productivity, and evaluate their organizational structure and corporate culture. They may also evaluate their IT needs and existing technology to determine how to create business flexibility and optimize the IT infrastructure.

In pursuit of achieving their business objectives, companies face four main challenges today:

- ▶ Continuous change
- ▶ Rigorous competition
- ▶ Financial pressures
- ▶ Unpredictable threats

These challenges require new levels of business flexibility, resulting in component-based business models that lead to greater flexibility. These business models reside on horizontal end-to-end business processes that are built to change as the needs of the business change. The new imperative for IT is to support these business designs with a services oriented IT infrastructure.

In support of the business models, clients need corresponding IT flexibility. This is an evolved infrastructure to support changing business needs, component-based applications that support horizontal processes, the automation and virtualization of resources, and business performance management

Getting a technology infrastructure that supports a company's On Demand Business initiatives involves an evolutionary approach whereby existing technologies deployed today within client environments can be used to extract immediate value and benefits to the business. We call this technology infrastructure an On Demand Operating Environment.

2.7.2 On Demand Operating Environment principles

Advances in technology and standards are eliminating barriers that have historically resulted in IT being a barrier for companies to overcome these business challenges through a services model.

What has changed? First, standards for creating services and allowing them to communicate have evolved and are agreed to by major vendors in the industry. With major vendors in agreement and providing broad industry support, interoperability moves beyond simple connectivity toward business level interoperability. Second, the infrastructure to support self defined, loosely-coupled services has emerged. Third, the tools to incorporate existing assets are available. Finally, automation and virtualization solutions are available to manage the infrastructure.

This is the underlying principle for the On Demand Operating Environment. It is based on a Service-oriented Architecture that allows applications, processes, and defined components to be mixed and matched at will. Through a Services Oriented Architecture, the On Demand Operating Environment supports end-to-end business processes and enables complete business performance management. The On Demand Operating Environment is delivered through core capabilities of Integration and Infrastructure Management, creating business flexibility and optimizing the IT infrastructure. Though the end result will be an evolved IT environment, many of the required components probably already exist within most enterprise IT environments.

The client needs increased focus on business flexibility. This need will support horizontal processes, where clients have to increase their focus on overall flexibility. It also must have the ability to take elements of processes that were not built to work together and make them work together, seamlessly and, just as important, quickly. Part of making this happen is the relentless use of open standards to enable communication and integration across the value net along with a partner to sharpen focus and respond to opportunities and threats.

Next generation technology requires an On Demand Business IT environment, a simpler, more manageable IT environment, to provide more flexibility. It needs the ability to repurpose application functionality in order to support horizontal processes, automation, and virtualization of resources.

2.8 IBM techniques for getting started with On Demand Business

There are multiple IBM techniques for helping clients achieve the essential business and IT breakthroughs of an On Demand Business. Some clients require assistance with their business design, while others require assistance with their IT infrastructure or IT processes.

Table 2-1 shows possible client starting points for On Demand Business, and the associated IBM techniques.

Table 2-1 Starting points for On Demand Business and the associated IBM techniques

What	Who	How
How do I start and prioritize for Business Transformation? What is my business plan?	The LOB Executive	Component Business Model™
How do I start and prioritize for IT Transformation? What IT projects should I deploy?	The CIO	Component Infrastructure Roadmap
How do I manage the integrated end-to-end IT infrastructure to meet business based service policies?	The CIO and VP of IT Operations	CBM for the Business of IT
How do I architect and design an application environment that supports our Business Transformation goals?	The LOB Executive and VP of Application Development	Service-oriented Modeling and Architecture

The Component Business Model, Component Infrastructure Roadmap (CIR), CBM for the Business of IT (CBM-BoIT), and Service-oriented Modeling and Architecture are described in Chapter 10, “IBM techniques for On Demand Business” on page 147.

2.9 An evolutionary initiative

Becoming an On Demand Business is an evolutionary initiative that happens over a period of time. The success lies in your ability to incrementally build an On Demand Operating Environment that is tightly aligned with your organization’s business goals and processes that would help transform your business to become an On Demand Business. The potential benefits of the On Demand Business model are simply astounding, and the path to get you there does not need to be complex or risky. It is a matter of starting and continuing with incremental projects based on the needs of your business, reinvesting cost savings from increased business and IT efficiencies, and leveraging existing assets and investments.



The Solution Designer's role

This chapter provides information about IBM's definition of the role of the Solution Designer as it relates to On Demand Business. It contains information about each of the following major tasks that the Solution Designer performs:

1. Gather and evaluate client business requirements
2. Identify and document current processes and infrastructure related to the business requirements
3. Design an On Demand Business solution
4. Validate the On Demand Business solution design
5. Present the solution to the client
6. Assist the project management team with implementation and deployment

3.1 An Overview of the Solution Designer Role

Like a building architect, much of the Solution Designer's work is focused on the front end of the solution life-cycle: listening to clients, understanding their business requirements, and systematically forming incrementally more detailed definitions of the structures of an information technology solution (an architecture). But, a full life cycle experience enables the Solution Designer to produce solution designs that are truly viable and that can be successfully constructed, implemented, operated, and managed. An effective Solution Designer should have some full life cycle experience.

The Solution Designer may also be involved during the construction of a solution as an advocate for the client, as the ultimate authority on the architecture that was produced to address the client's business problem, and to provide technical leadership and guidance to the construction team.

The role of the Solution Designer is gaining increasing popularity in information technology departments. The Solution Designer is an individual who has a broad understanding of both legacy and emerging technologies and their applications for solving business challenges of today.

Solution Designers have strong technical skills complemented by equally strong business and relationship skills. They are viewed as consultants not only to the client but also to the project implementation team. They are valued because of their ability to analyze a client's business and IT challenges and then design a comprehensive solution that addresses the needs of each. The solution integrates smoothly into the client's environment while leveraging the appropriate products, technologies, architectures, and techniques.

Solution Designers bridge the gap between pre-sales engineers and project delivery teams through applying a combination of business analysis, cross-product technical knowledge, On Demand Business knowledge, and experience to design, propose, and present solutions. The Solution Designer frequently works with an account/sales manager or, in some cases, an IT services manager.

The solutions are often focused on initiatives that cross functional groups or business units within the client's environment. As a result, the Solution Designer's relationship skills and experience are critical to help identify potential risks and define appropriate technologies for the implementation of the new solution. The Solution Designer will not only select the appropriate combination of IBM technologies, but will also evaluate the opportunity to integrate strategic technologies, such as open source, grid computing, virtualization, and emerging business offerings.

The goal of the Solution Designer is to provide solution advice and support that enables a client to confidently define projects and accelerate purchase and deployment decisions. This guidance should help the client realize optimum return on their IT investment and clearly identify how the solution will meet their business and IT objectives. The Solution Designer often reports to a sales or consulting manager and works together with solution delivery teams to align the appropriate skills to complete the solution implementation. While it is beneficial for the Solution Designer to have specific industry experience, the Solution Designer should have a broad knowledge of various business units and their functions within a given organization in order to properly define the business benefits of a particular solution.

In this era of On Demand Business, the Solution Designer's role has become even more critical to a business. The Solution Designer must clearly understand what On Demand Business is, why their company should strive to become on demand, and what solutions will take them - or continue them - on their On Demand Business journey.

The following sections provide information about the tasks and subtasks that a Solution Designer performs in their quest to help a business become on demand.

3.2 Gather and evaluate client business requirements

A requirement is a business opportunity that should be realized or a business problem that must be overcome. A good requirement is one that is complete, consistent, correct, modifiable, traceable, unambiguous, prioritized, understandable, and verifiable. Gathering and evaluating requirements involves the Solution Designer talking with business leaders to determine and prioritize what they are. Business requirements gathering is an important exercise for many reasons, because it:

- ▶ Reduces the likelihood that an inappropriate solution will be implemented.
- ▶ Exposes other business problems that may also need to be addressed.
- ▶ Drives the creation of a statement of work and project acceptance criteria.
- ▶ Drives the creation of a project plan contributing directly to resources, tasks, and time lines.
- ▶ Reduces the likelihood of scope creep. (Scope creep refers to projects that gradually extend beyond their original charters and add function that requires unplanned work.)
- ▶ Stimulates discussion about alternative solutions.
- ▶ Focuses the team on activities that directly impact the business problem, resulting in faster, more efficient execution.

For On Demand Business, the requirements that surface should help the client's company improve their responsiveness, focus, variability, and resiliency.

A thorough requirements-gathering exercise is part of the process to scope a project; it should be performed before entering into the actual development and delivery of a solution. Unless a project is either very small and simple (measurable in days), or the project work has been reduced to a cookie-cutter science, it would be risky to enter into a project that has not been properly designed and scoped.

Often, clients do not thoroughly understand On Demand Business or when their requirements dictate an On Demand Business Solution. A client may simply seek the expertise of a Solution Designer in order to validate a solution they have already conceived. For example, a client who would like to reduce facilities expenses by establishing offices at home may conclude that they need to extend e-mail to their employees over the Internet. Some clients believe this can be done by opening a few ports through the firewall (and some have). However, the consequences of such actions can be disastrous, and the Solution Designer knows why.

Although extending corporate e-mail to employees over the Internet may not seem like a requirement that leads to an On Demand Business solution, it is. An assessment should be performed, security must be scrutinized, an infrastructure to support it must be designed and implemented, and an access method must be established for the employees in order to authenticate them and provide them with a user interface.

However, extending e-mail to office-at-home employees is only a partial solution. Provisions need to be made for accessing other business applications (like time and expenses), accessing the corporate intranet, and for obtaining both training and support.

The results of the requirements-gathering exercise should be documented and ultimately used to determine the satisfactory completion of the project. The inclusion of measurable

business requirements is also essential. Effective requirements gathering is pivotal with regard to the successful implementation of any solution.

The subtasks of this task that are described in this section are as follows:

- ▶ Determine what business goals the client is trying to achieve.
- ▶ Identify information that needs to be gathered to understand business requirements.
- ▶ Identify critical design factors (for example, extensibility, manageability, scalability, and availability).
- ▶ Identify client's budget/time/resource constraints.
- ▶ Identify client's long-term objectives/strategies.
- ▶ Identify client's business rules and policies.

3.2.1 Determine what business goals the client is trying to achieve

A solution must help a business attain its business goals. If not, time and money have been wasted on the solution's design and implementation. Therefore, the Solution Designer must determine and prioritize what the business goals are. Business goals address how to increase productivity, become more efficient, streamline operations, automate business processes, improve client satisfaction, and leverage product lines. Business goals should be measurable, and early measurements need to be taken in order to provide a basis for comparison at the end of a project.

In addition to uncovering business goals, the Solution Designer will also uncover strategic and technical goals. Strategic goals include such issues as human resources (HR) strategies, building brand recognition, mandatory government legislation, marketing drives, and responding to public perception about products or services. Technical goals encompass aligning business and technical processes, improving quality, enhancing products, and using emerging technologies. All of the client's goals are important; however, the Solution Designer must never lose sight of what business goals are most important - and why - and the measures that will indicate the goals have been met.

3.2.2 Identify information that needs to be gathered to understand the business requirements

Requirements are living sets of records that change over time as an organization as a whole changes to cope with market demands. Therefore, when interviewing business leaders, it is quite a challenge for the Solution Designer to pose the right questions in obtaining the right requirements - but accurate requirements are crucial in order for a Solution Designer to help transform a business to on demand.

Requirements can be broadly classified in terms of:

- ▶ User interface requirements
- ▶ Business processes requirements
- ▶ Infrastructure requirements
- ▶ Data requirements
- ▶ Integration/interface requirements

An effective interview with the client should bring out the most critical pain points that their organization is facing with respect to:

- ▶ Revenue growth
- ▶ Ability to contain operational costs
- ▶ Enabling effectiveness of people across the organization

- ▶ IT and business alignment
- ▶ Responsiveness and agility of business to change
- ▶ Ability to thwart security threats

The primary goal of this subtask is to identify the components or processes of business as they are today, analyze if they need to be transformed, and, if so, what would be their return on investment (ROI) or effectiveness over a period of time.

Based on this approach, the criticality or priority of the work effort with respect to the client's business goals is identified so that it could be mapped in a model, such as Components Business Model (CBM). Information about CBM is contained in Chapter 10, "IBM techniques for On Demand Business" on page 147.

Typically, requirements are captured via use cases. Business use cases describe business flows. They determine who is the source of information and who is the target, but they do not contain information about the technical implementation of the flow.

Use cases in general describe what a business function or process can do to achieve the goal for an actor - which could be a user, system, partner, vendor, or third party. Since use cases are a direct representation of high level business requirements, they are living documents as well and are subject to change and revision as more details are available and gathered iteratively.

A typical business use case should help identify the following:

- ▶ Business actors
- ▶ Business workers
- ▶ Goal of the process or system or requirement
- ▶ Business function
- ▶ Scope
- ▶ Priority
- ▶ Feasibility
- ▶ Testability

The following is an example of a use case template for the business process of checking a book out of a library:

Use case	The member checks out a book.
Actor	The member, librarian, or library system.
Pre-condition	The member is already registered and the book is available.
Post-condition	The book status is Not Available. The member's total number of books checked out is incremented.
Business rule	The member cannot reserve more than 10 books at a time. The books can be kept for a period of three weeks. The member has to pay dues before checking out any new books.

Based on the information gathered, a story board - A Day in the Life of Librarian - could be constructed.

More information about use cases can be found at the following URLs:

<http://alistair.cockburn.us/usecases/usecases.html>
<http://alistair.cockburn.us/crystal/books/weuc/weuc0002extract.pdf>

3.2.3 Identify critical design factors (for example, extensibility, manageability, scalability, and availability)

The Solution Designer needs to identify the critical solution design factors, which are elements that, if not met, would be disastrous to the solution's implementation, long-term success, or acceptance by its users. With regard to On Demand Business solutions, performance, availability, scalability, usability, manageability, flexibility, and security are typically critical. These are referred to as *non-functional requirements*.

3.2.4 Identify client's budget/time/resource constraints

Early in the solution design process, the Solution Designer needs to know when the solution must be operational (or when the requirements must be met), how much money has been approved to spend on the solution, and how many people have been authorized to work on it. These are basic facts that would seem to be well known, but problems arise when these are not documented, approved, and clearly communicated so that all parties involved in the solution are working under the same assumptions.

3.2.5 Identify client's long-term objectives/strategies

Business leaders today are under such intense pressure to deliver results year-to-year and quarter-to-quarter that it is difficult for them to find time to devise long term strategies. However, the Solution Designer must work with the business leaders to understand their long-term objectives and strategies so that the solution will be designed to support the long-term business direction. Examples of long-term business process strategies that affect solution design are:

- ▶ Company growth rates
- ▶ Merger, acquisition, and divestiture strategies and plans
- ▶ Integration plans for internal or legacy systems
- ▶ Software platforms, software standardization, and software distribution plans
- ▶ Worldwide implementation plans (languages, currencies, and time zones)
- ▶ Disaster recovery and hardware redundancy plans
- ▶ Facility changes, such as data center moves, relocation of headquarters, or building acquisitions and disposal plans
- ▶ Future software deployments, such as Instant Messaging, video conferencing, and compression or encryption software plans
- ▶ Plans for implementation of server monitoring software
- ▶ Anticipated network topology or bandwidth changes
- ▶ Anticipated business process changes
- ▶ A future implementation of business intelligence software

These long-term business process strategies have a direct impact on the design of a solution. For example, a client that would ultimately like to implement Business Intelligence to track the activity of its clients should refrain from using cookies to store the contents of shopping carts locally on the consumer's computer. The information should be stored on the server. This seemingly small design decision will not only ensure that the Business Intelligence systems that are implemented in the future will have access to older shopping cart data, it will also prevent the need to rewrite, test, and deploy changes to application design.

3.2.6 Identify client's business rules and policies

This subtask involves identifying and documenting business rules and policies. Within this section, the term business rule is used to refer to both business rules and policies.

A business rule:

- ▶ Provides a set of conditions that govern business behavior
- ▶ Provides the criteria for when an action is successfully or unsuccessfully completed
- ▶ Stipulates what other actions can or cannot be performed as a result of successful or unsuccessful completion
- ▶ Specifies the response to some external event that impinges on the enterprise
- ▶ Governs relationships that need to apply among various business entities

Interviews and meetings with subject matter experts will identify some business rules. Others are embedded and enforced by the automated data processing systems. Many can be found in procedures manuals, human resources practices, and other prescriptive business documentation. For example, a flight attendant's in-flight service manual is almost a pure set of business rules. From procedures at the gate, including what announcements to give prior to push back to procedures for handling various types of in-flight emergencies, such a book is packed with carefully considered, precisely worded rules that have been tested in experience.

A simple template for documenting a business rule is as follows:

- ▶ Business Rule Type
- ▶ Business Rule Name
- ▶ Business Rule
- ▶ Business Rule Comments

An example business rule for a store that has a gift registry program would be:

Business Rule Type Gift Registry.

Business Rule Name Registry Form Quality Assurance.

Business Rule When client returns gift registry form, a Sales Associate searches for errors and illegibility on the Gift Registry form.

Business Rule Comment

This rule needs to be continued in force in the context of the new Gift Registry system, though the exact nature of the quality assurance requirement may change considerably, pending a capability to electronically read product codes

Business rules can be compiled into a business rules catalog for effective capture, location, and update.

3.3 Identify and document current processes and infrastructure related to the business requirements

To build a solid foundation of understanding on which to design an On Demand Business solution, the Solution Designer must identify and document the current processes and infrastructure related to the business requirements the solution will address.

The subtasks of this task are as follows:

- ▶ Identify the critical as-is and desired processes and determine the gaps.
- ▶ Identify the relationship between a client's processes and infrastructure and the potential solution designs.
- ▶ Recommend business process optimization as dictated by client requirements.
- ▶ Determine the potential impact of existing processes and infrastructure on possible solution designs.
- ▶ Determine the appropriateness of an On Demand Business solution based on client requirements, processes, and infrastructure.
- ▶ Verify and document the existing infrastructure.

3.3.1 Identify the critical as-is and desired processes and determine the gaps

There are many benefits in understanding the business processes to be affected by an On Demand Business solution:

- ▶ A greater level of understanding about all relevant business processes is obtained.
- ▶ A transition plan from old processes to new processes can be created.
- ▶ The client will be able to make the appropriate personnel- and process-related changes in anticipation of the new solution.
- ▶ Application design requirements will be exposed.

It is a common mistake to attempt to automate an existing business process without first attempting to improve it. Often business processes change over time for inappropriate reasons such as employee terminations or due to organizational restructuring. Similarly, some processes completely break down when a key player goes on vacation or becomes otherwise unavailable.

The purpose of this subtask is to analyze the existing business processes and to identify gaps in what exists versus what is needed. The result of this exercise will contribute directly to the application requirements in anticipation of the new On Demand Business solution.

An approach is to:

1. Interview the individuals who have a high-level understanding of the business processes.
2. Create rough-draft diagrams of the business processes (inputs, steps, and outputs) and review them with all of the individuals involved.
3. Update the business process diagrams and documentation appropriately.
4. Repeat this cycle until all impacted business processes are documented accurately.

Note: The client may already have documentation for their business processes. If so, review the documentation with all of the individuals involved in the business process and begin at the third step above.

3.3.2 Determine the potential impact of existing processes and infrastructure on possible solution design

Business processes are re-designed for one of two reasons:

1. The existing process is inefficient or unreliable.
2. Automation forces process re-engineering.

When redesigning a business process, the impact of the changes should quickly become apparent. This exercise, however, can become uncomfortable very quickly; individuals involved in the business process may feel threatened by their elimination from the process. Some business processes can be automated entirely, leaving many to wonder whether or not they will continue to be employed; this situation is aggravated further by the need to obtain information from them.

In some cases, people are notified before a project begins that their jobs are being eliminated. In other cases, a person's job may simply be changing. For example, instead of evaluating hard copy forms, the forms will be digitized and evaluated on the computer. In this scenario, the individual(s) involved may simply need training.

Regardless of the reason for process re-engineering, a plan for transition is required. In the event that a process is totally automated, someone still needs to monitor the system, perform maintenance, and handle problems. Overlooking the transition plan can make a well-designed solution look bad.

Similarly, each business process typically has inputs and outputs. These inputs and outputs need to be identified and possibly changed in order to work with the new system.

For example, a company would like to set up an e-commerce Web site. This company is a telemarketing company that takes orders by telephone and delivers them via hardcopy directly to shipping. The new process would allow clients to enter orders via a Web browser or over the telephone. In this scenario, the sales technicians that will continue to handle phone orders will need a Web browser and either an internal or external connection to the Web site (in order to take client orders). Depending on the solution implemented, it may be necessary to make special arrangements with the shipping department for communication of client orders.

Identification of the inputs and outputs associated with each business process should reveal all of the business units that will be affected by the new solution.

With the inputs, outputs, and the affected business units identified, the impact of the change should be determined. The change may be inconsequential or it could be dramatic. For example, implementation of a new expense system may require that all receipts are scanned and attached to electronic documents. The sooner such impacts are exposed the better.

3.3.3 Determine the appropriateness of an On Demand Business solution based on client requirements, processes, and infrastructure

In this subtask, the Solution Designer “brings it all together.” They look at the business requirements that need to be met, the current business processes that are in place, or need to be put in place to meet the requirements, and the infrastructure that supports the requirements and processes.

3.3.4 Verify and document the existing infrastructure

It would be insurmountable to attempt to identify the entire infrastructure of a business, for example, every physical hardware node within the company. The focus of this task should be to identify the hardware, software, and networking that are related to the On Demand Business solution. The Solution Designer should obtain all available documentation and conduct interviews with the infrastructure teams in order to ensure that the information is updated and accurate.

One or more diagrams should be created that depict all of the hardware and software for the current infrastructure as it relates to the future On Demand Business solution.

3.4 Design an On Demand Business solution

The term design means different things to different people. Technically, to design is to determine the arrangement of parts and details of something according to a plan. Formulation of architectures (solution designs) and component designs (the detailing of a component of a solution) are both examples of design work, albeit of a very different scope. And while an architecture is a design, most designs are not architectures. A single component or a new function of an existing solution normally has a design that has to fit within an overall architecture.

The subtasks of this task that are described in this section are as follows:

- ▶ Follow industry-accepted principles for solution design (that is, best practices, methodologies, and architectural approaches).
- ▶ Evaluate and select patterns based on client requirements.
- ▶ Identify and evaluate solution options to finalize an approach.
- ▶ Assemble components into a functional On Demand Business solution based on business requirements.
- ▶ Identify and evaluate solution component options
- ▶ Incorporate ease-of-use requirements into the solution design.
- ▶ Create a projection of the ROI/TCO of the solution.

3.4.1 Follow industry-accepted principles for solution design (best practices, methodologies, and architectural approaches)

There are many architectural/design methodologies and frameworks in the market today. For some of them, the On Demand Business solution design phase is a portion of the entire solution development process that they address.

There are several things to consider when choosing a methodology or framework, as listed below:

- ▶ What is the specific goal of the method?
- ▶ What is the starting point of the method?
- ▶ What are the results of the method?
- ▶ What are the models represented and manipulated by the method?
- ▶ What design steps are used to accomplish the method's specific goal?
- ▶ What are the tools supporting the method?
- ▶ Has the method been validated in practical cases?
- ▶ Is the method openly available?

This section provides information about architectural/design methodologies and frameworks with which the Solution Designer should be familiar.

The Open Group Architecture Framework (TOGAF)

The Open Group Architecture Framework (TOGAF), is an industry standard architecture framework that may be used freely by any organization wishing to develop an information systems architecture for use within that organization. TOGAF Version 8 Enterprise Edition is a detailed method and set of supporting resources for developing an Enterprise Architecture.

There are four types of architecture that are commonly accepted as subsets of an overall Enterprise Architecture, all of which TOGAF is designed to support:

- ▶ A business (or business process) architecture: This defines the business strategy, governance, organization, and key business processes.
- ▶ An application's architecture: This kind of architecture provides a blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organization.
- ▶ A data architecture: This describes the structure of an organization's logical and physical data assets and data management resources.
- ▶ A technology architecture: This describes the software infrastructure intended to support the deployment of core, mission-critical applications. This type of software is sometimes referred to as middleware.

For information about TOGAF, refer to 4.2.1, “The Open Group Architecture Framework (TOGAF)” on page 53 and the following URL:

<http://www.opengroup.org>

The IBM Global Services (GS) Method

IBM Global Services Method (the Method) is the work product based method used to deliver services offerings and industry solutions within IBM. Work product based methods enable reuse of knowledge and assets, and are the foundation of an asset based services delivery model. The Method provides a common structure for the creation and reuse of work products. It is a fundamental component to accelerating the BCS vision to be the global leader in business and IT consulting services in delivering innovative solutions that create real business value for clients. The Method is based on work products, the common building blocks used on engagements, forming the basis of how we propose solutions, manage projects, ensure quality of delivery, and manage intellectual capital. Related work product descriptions, technique papers, and dependency diagrams are packaged into engagement models, which define the work to be done and what needs to be developed. All IBM Methods are integrated within the IBM Global Services Method framework.

The IBM Technical e-Business Architecture Method

IBM Technical Architecture Method (TeAMethod) is the strategic link between the Signature Selling Method, used by sellers, and the services methodology used by IBM Global Services. TeAMethod is a method for designing solutions, specifically for Software & Development technical architects and specialists. It is based on a methodology used by IBM Global Services, and streamlined for use in presales and sales environments. TeAMethod provides a collaborative framework for the entire sales and services team, and it is integrated with Signature Selling Method, using the same steps and outcomes.

Zachman Framework for Enterprise Architecture

Zachman Framework for Enterprise Architecture is an approach for documenting and developing an enterprise-wide information systems architecture. This framework provides multiple perspectives of the overall architecture and a categorization of the artifacts of the architecture.

The Zachman Framework is a matrix of 36 cells covering the Who, What, Where, When, Why, and How questions of an enterprise. The enterprise is then split into six perspectives, starting at the highest level of business abstraction going all the way down to implementation. Such objects or descriptions of architectural representations are usually referred to as *artifacts*. The framework can contain global plans as well as technical details, lists, and charts. Any appropriate approach, standard, role, method, or technique may be placed in it. Although

frequently looked at as a framework for building computer systems, the Zachman Framework is actually a classification scheme for descriptive representations of the enterprise as a whole, irrespective of its use of computers.

For information about Zachman, refer to:

<http://www.zifa.com/>

C4ISR Architecture Framework

The acronym C4ISR stands for Command, Control, Computers, Communications (C4), Intelligence, Surveillance, and Reconnaissance (ISR). The C4ISR Architecture Framework Version 2.0 is a framework providing comprehensive architectural guidance for all of these related Department of Defense (DoD) domains. The purpose is to ensure interoperable and cost effective military systems. C4ISR has emerged in recent years as a successor to Technical Architecture Framework for Information (TAFIM), which was officially withdrawn in January 2000. The C4ISR Framework is being generalized so that it can apply to all functional areas of the Department of Defense. Its use has expanded to areas beyond the defense sector. This framework was developed in reaction to the increasing development of different architectures popping up around the world in the many disparate DoD groups. They were not sharing between each other and the interrelationship between the many domains was not being reflected, resulting in inefficiency and a lack of integration ability. The C4ISR Architecture Framework is intended to ensure that the architecture descriptions developed by the various commands, services, and agencies within DoD are inter-related between and among each organization's operational, systems, and technical architecture views, and are comparable and can be integrated across joint and multi-national organizational boundaries.

For additional information about C4ISR, refer to:

<http://www.afcea.org/education/courses/archfwk2.pdf>

CORBA

CORBA is the acronym for Common Object Request Broker Architecture, The Object Management Group's Object Management Architecture (OMA). CORBA is an object-oriented application architecture centered on the concept of an Object Request Broker (ORB). The Object Request Broker acts as a switching center, locating objects, storing interface definitions and object implementations, and relaying messages between objects in a distributed heterogeneous environment. CORBA services are a low-level set of common object services available to all objects, covering functions like object creation and deletion, naming, security services, and many others. Horizontal CORBA facilities are higher-level functions, such as distributed documents or printing, suitable for use in a wide variety of market sectors. Domain CORBA facilities are vertical market-specific interfaces that will provide common facilities for applications within a particular market sector.

For information about CORBA, refer to:

<http://www.omg.org/gettingstarted/specintro.htm#OMA>

Enterprise Architecture Planning (EAP)

Enterprise Architecture Planning (EAP) is a set of methods for planning the development of information, applications, and technology architectures (the recommended approach being to develop them in that order), and for aligning the three types of architecture with respect to each other. The goal is to ensure that such architectures form the blueprints for sound, implementable systems that solve real business problems.

The overall EAP methodology involves the following steps:

1. **Planning Initiation:** Defining scope, objectives, roles and responsibilities, and deciding which methodology to use, who should be involved, and what toolset to use. This leads to producing a work plan for the Enterprise Architecture Planning activity and securing management commitment to go through all of the following phases.
2. **Principles:** Developing the core principles to support the effective governance of information and technology. These principles form the basis for making architectural decisions, accepting the results, and managing the migration. They are based on industry best practice and the enterprise's purpose, vision and values, and are implemented through policies, procedures, and standards.
3. **Business Modeling:** Modeling the current business activities and the information used, and identifying business process improvement opportunities.
4. **Current Systems and Technology:** Defining what is in place today for application systems and supporting technology platforms. This is a summary-level inventory of application systems, data, and technology platforms to provide a baseline for long-range migration plans.
5. **Data Architecture:** Developing the data architecture, including defining the major business activities and data objects needed to support the business.
6. **Applications Architecture:** Defining the major kinds of applications needed to manage the data and support the business functions.
7. **Technology Architecture:** Defining the platforms needed to provide a technological infrastructure for the applications that manage the data and support the business functions.
8. **Implementation/Migration Plans:** Defining the sequence for implementing applications, a schedule for implementation, a cost/benefit analysis, and a clear step-by-step path for migration. Executive-level recommendations are made for implementing the plan, and a plan is developed for the transition period after following the Enterprise Architecture Planning activity.
9. **Planning Conclusion:** Final report and presentation of the results to management.

The EAP methodology thus positions the four types of architecture in the sequence: Business Architecture, Data Architecture, Applications Architecture, and IT (or Technology) Architecture as the recommended sequence.

Federal Enterprise Architecture Framework (FEAF)

The US Federal CIO Council published the Federal Enterprise Architecture Framework Version 1.1 in September 1999. The FEAF promotes shared development for U.S. federal processes, interoperability, and sharing of information among U.S. federal agencies and other governmental entities. The FEAF provides direction and guidance to Federal agencies for structuring enterprise architecture. The FEAF describes eight components of enterprise architecture: Architecture Drivers, Strategic Direction, Current Architecture, Target Architecture, Transitional Processes, Architectural Segments, Architectural Models, and Standards. The FEAF also provides direction for establishing Federal segments, which are cross-agency business areas (such as international trade, grants, and common patient records) that transcend federal agency boundaries. These federal architectural segments collectively constitute the Federal Enterprise Architecture. The FEAF partitions a given architecture into business, data, applications, and technology architectures. The FEAF currently includes the first three columns of the Zachman Framework and the Spewak Enterprise Architecture Planning (EAP) methodology.

For information about EAP, refer to the following links:

https://secure.cio.noaa.gov/hpcc/docita/files/federal_enterprise_arch_framework.pdf
<http://www.whitehouse.gov/omb/egov/>

Popkin Enterprise Architecture Framework

Popkin Enterprise Architecture Framework is based upon the Zachman Framework for Enterprise Architecture, but uses the diagrams and definitions of System Architect. Combining Business, Object Process, and Data Modeling capabilities into a single product with a single repository, System Architect is a modeling tool for the entire enterprise. Models provide a way of representing enterprise knowledge so that technical and non-technical people can understand and benefit from it. Modeling is an expression of concepts that allow each part of an organization to understand and contribute to its own evolution. Models only become meaningful to the Enterprise when they cause action and provoke thought, and that only happens when all parts of an organization work together. The Popkin Enterprise Architecture Framework organizes these models into useful categories. The Popkin Process is a set of scenarios for using the Popkin Enterprise Architecture Framework. The Popkin Process addresses:

- ▶ How to make relationships between the cells in the framework
- ▶ How to use the framework to reveal the enterprise architecture
- ▶ How to choose tools and when to use them
- ▶ How to produce the designs and deliverables necessary to achieve the goals of the business

For information about Popkin, refer to:

<http://www.popkin.com>

Treasury Enterprise Architecture Framework (TEAF)

In July 2000, the Department of the Treasury published the Treasury Enterprise Architecture Framework. The TEAF provides:

- ▶ Guidance about Treasury bureaus concerning the development and evolution of information systems architecture
- ▶ A unifying concept, common principles, technologies, and standards for information systems
- ▶ A template for the development of the enterprise architecture

The TEAF describes an architectural framework that supports the Department of Treasury's business processes in terms of work products. This framework guides the development and redesign of the business processes for various bureaus in order to meet the requirements of recent legislation in a rapidly changing technology environment. The TEAF prescribes architectural views and a set of essential and supporting work products to portray these views.

The TEAF's functional, information, and organizational architecture views collectively model the organization's processes, procedures, and business operations. By grounding the architecture in the business of the organization, the TEAF defines the core business procedures and enterprise processes. Through its explicit models, a TEAF-based architecture enables the identification and reasoning of enterprise- and system-level concerns and investment decisions.

For information about TEAF, refer to:

<http://www.treas.gov/tigta/auditreports/2002reports/200220124fr.html>

3.4.2 Evaluate and select patterns based on client requirements

Identifying business patterns and solution scenarios is a process that is similar to researching competitive solutions. A Solution Designer should attempt to identify the business pattern that most closely addresses his client's objectives, and refine the pattern to specifically resolve his client's needs.

The Solution Designer should know that IBM Patterns for e-business continue to apply in an on demand world. Patterns for e-business are a group of reusable assets that can help speed the process of developing Web-based applications. The patterns leverage the experience of IBM architects to create solutions quickly, whether for a small local business or a large multinational enterprise. client requirements are quickly translated through the different levels of patterns assets to identify a final solution design and product mapping appropriate for the application being developed.

Each business pattern maps to a particular business need, such as supply chain management. For example, a client that needs a solution that will integrate its systems with their suppliers and clients, automating inventory replenishment and order delivery is a possible candidate for the Supply Chain Management business pattern.

The IBM Patterns for e-business web site can be found at:

<http://www-128.ibm.com/developerworks/patterns/>

This site breaks down reusable assets into the following elements:

- ▶ Business patterns identify the interaction between users, businesses, and data. Business patterns are used to create simple, end-to-end applications.
- ▶ Integration patterns connect other business patterns together to create applications with advanced functionality. Integration patterns are used to combine business patterns in advanced applications.
- ▶ Composite patterns are combinations of business patterns and integration patterns that have themselves become commonly used types of applications. Composite patterns are advanced applications.
- ▶ Custom designs are similar to composite patterns, as they combine business patterns and Integration patterns to form an advanced, end-to-end solution. These solutions, however, have not been implemented to the extent of composite patterns, but are instead developed to solve the business problems of one specific company, or perhaps several enterprises with similar problems.
- ▶ Application and runtime patterns are driven by the client's requirements and describe the shape of applications and the supporting runtime needed to build the application.
- ▶ Product mappings to populate the solution. The product mappings are based on proven implementations.
- ▶ Guidelines for the design, development, deployment, and management of applications.

3.4.3 Identify and evaluate solution options to finalize an approach

Clients need to understand where they are today, and where they want to go, on their on demand journey. To this end, IBM has developed a family of On Demand Business component techniques and adoptions models that accelerate the client's journey to becoming an on demand business. These techniques and models facilitate long-term planning for on demand transformation, link IT transformation to business requirements, and enable clients to more fully leverage IBM's extensive and industry-leading problem-solving expertise. The techniques introduced in this section are the Component Business Model (CBM), the Component Business Model for the Business of IT (CBM-BoIT), and the Component

Infrastructure Roadmap (CIR). The adoptions models are autonomic computing and grid computing. This section also introduces IBM tools that are available for helping the client and Solution Designer choose the appropriate on demand business solution design. The tools are IBM Automation Assessment, IBM Technology Assessment, and IBM Grid Value at Work.

Component Business Model (CBM)

The Component Business Model allows a client to begin solution design from a business perspective. A Component Business Model is a logical representation, or map, of a business that reveals its essential building blocks. It is a new technique for modeling an enterprise into non-overlapping and unique components. Each component is a logical grouping of the people, technology, and resources that deliver specific business value, and could potentially operated independently. CBM is a technique for dissolving an enterprise into its constituent building blocks or components. Traditional components are human resources or finance. Additional information about CBM can be found in 10.1.1, “Component Business Model” on page 148.

Component Business Model for the Business of IT (CBM-BoIT)

The Component Business Model for the Business of IT allows a client to begin solution design from an IT perspective. CBMs have been created for most of the industry, and are being utilized in a variety of ways. For the IT industry, CBM-BoIT provides a framework for running the business of IT, using exactly the same technique as CBM: first, create a universal map, then begin to explore how different factors such as industry, strategic intent for IT, various technologies, and sourcing strategies could alter the basic map. Components provide high level definitions of the activities and resources necessary to define and operate an IT services environment supporting an On Demand Business. The components provide the IT services to the business. CBM-BoIT can help identify optimization and transformation benefits and support IT leadership decisions. CBM-BoIT is described in more detail in 10.1.3, “Component Business Model for the Business of IT” on page 152.

Component Infrastructure Roadmap (CIR)

Clients need to develop long range strategic IT plans that link their infrastructures to their business strategy, which will:

- ▶ Optimize their IT environment
- ▶ Increase business flexibility
- ▶ Enhance business resilience and security
- ▶ Leverage information insights

The Component Infrastructure Roadmap is a technique that facilitates the on demand transformation of a client's IT infrastructure linked to their business goals. The Component Infrastructure Roadmap delivers a customized roadmap that identifies the specific projects needed to move an individual client's IT infrastructure from its current state to a desired future state. CIR is described in more detail in 10.1.2, “Component Infrastructure Roadmap” on page 150

Services Oriented Modeling Architecture (SOMA)

Service-oriented Modeling and Architecture (SOMA) is an IBM software design method for mapping business processes to a service-oriented architecture (SOA). Refer to 10.1.4, “Services Oriented Modeling and Architecture (SOMA)” on page 156 for information about SOMA. 6.2.1, “Service-oriented architecture (SOA)” on page 71 contains information about SOA.

Autonomic Computing adoption model

Autonomic computing provides the technology to enable information systems to be self-managing. Autonomic computing is defined by four characteristics that define its components:

- ▶ Self-configuring: The ability to adapt to dynamically changing environments
- ▶ Self-healing: The ability to discover, diagnose, and act to prevent disruptions
- ▶ Self-optimizing: The ability to tune resources and balance workloads to maximize the use of information technology resources
- ▶ Self-protecting: The ability to anticipate, detect, identify, and protect against threats.

An autonomic computing adoption model exists that defines five levels of maturity. The model allows progress to be measured in attaining autonomic computing. Information about the autonomic computing adoption model can be found in “Autonomic computing adoption model” on page 166.

Grid Computing adoption model

Grid computing is fundamental to On Demand Business. With grid computing, organizations can connect and use a variety of computer and data resources, regardless of operating systems and platforms, as if it was one system. Information about the grid computing adoption model can be found in “Grid computing adoption model” on page 171.

IBM Automation Assessment Tool

The IBM Automation Assessment Tool is a consulting tool that helps assess the maturity of the client's existing IT infrastructure and its autonomic capabilities. The tool helps guide the development of their infrastructure management strategies to build an On Demand Operating Environment. The tool helps evaluate how the clients can transform their IT infrastructure to better serve their present and future business needs.

For more information about this tool, see:

<http://www-306.ibm.com/software/tivoli/resource-center/overall/dem-auto-tool.jsp>

IBM Technology Assessment Tool

The IBM Technology Assessment Tool (for Business Partners) is an opportunity identifier tool that helps clients identify their IT maturity in terms of On Demand Operating Environment capabilities. Using the Component Infrastructure Roadmap technique, the tool is based on four domains (Business Function Services, Information Services, Common IT Services, and Infrastructure Services) that are assessed by considering four levels of maturity (Discrete, Partial Integration, Enterprise Integration, and Partner Collaboration). Clients develop long-range strategic and tactical IT plans that link their infrastructures to their business strategy. The tool provides a technology blueprint that is based on the client's current capabilities and IT goals. The client can determine where and how to get started to transform their IT infrastructure by prioritizing the project recommendations and aligning their IT strategy with their business objectives. More information about this tool can be found at:

http://www-1.ibm.com/partnerworld/pwhome.nsf/mktgsale/nws_index.html

IBM Grid Value at Work Tool

The IBM Grid Value at Work tool provides companies a way to predict expected business value before investing in a grid infrastructure. For further information about this tool, refer to:

http://www-1.ibm.com/grid/about_grid/ibm_grid/products_services.shtml

3.4.4 Assemble components into a functional On Demand Business solution based on business requirements

This is the lifeblood of the On Demand Business solution design. At a high level, this work includes:

- ▶ Describing how IBM strategies form the basis for the functional On Demand Business solution design
- ▶ Identifying the type of architecture (for example, two-tier, three-tier, n-tier, and client-side versus server-side processing) that best meets the On Demand Business requirements
- ▶ Identifying the functional components of the On Demand Business architecture (for example, types of clients (wireless or wired), types of servers, and back-end systems)
- ▶ Identifying the critical design issues and devising potential trade-offs (for example, hardware and technology limitations)
- ▶ Determining where and how the functional On Demand Business solution design will integrate with the existing infrastructure

3.4.5 Identify and evaluate solution options

As Solution Designers select patterns, they encounter situations that require trade-offs of various patterns. Using an architecture decision methodology, the Solution Designer will arrive at the final solution components, design, and technologies that will be used to build the On Demand Business solution.

The Solution Designer subtasks that comprise identifying and evaluating solution options are as follows:

- ▶ Describe content requirements (for example, data structure, data access, internationalization, and bandwidth).
- ▶ Describe application design and development requirements (for example, standards, frameworks, J2EE, integration, Web services, and XML).
- ▶ Describe technology requirements (for example, user node/client, connectors, network infrastructure, application server, directory and security servers, firewall, data and data tools, storage, business applications, existing applications, and application development tools).
- ▶ Describe infrastructure management requirements (for example, performance, availability, configuration, operations support, protocols, load balancing, specialized service, network, storage, integration, interoperability, and self-managing technologies).
- ▶ Describe security considerations to be applied to the solution design (for example, network security, encryption, access, authentication, authorization, privacy, and business security policies).
- ▶ Apply appropriate requirements to select components for the On Demand Business solution.
- ▶ Document the component selection through appropriate design documentation (for example, topology diagram, design process, competitive comparison matrix, trade-off analysis, and map to business requirements).
- ▶ Validate the technical design and runtime architecture.

IBM tools, such as the Technology Assessment Tool and the Automation Assessment Tool, recommend hardware and software products that can be considered components of On Demand Business solutions.

3.4.6 Incorporate ease-of-use requirements into the solution design

Ease of use is vital to the success of On Demand Business solutions, and User Engineering is an industry accepted process for designing usability into them. User Engineering (UE) is a significant evolutionary advancement in the process of developing offerings that satisfy and delight users, as well as the stakeholders who invest in bringing them to life. It requires an understanding of value propositions — the values that users seek, how a solution will provide those values, and the values sought by the business providing it. The objective is a balanced design that provides value for the business, stakeholders, and users. UE is based on delivering this measurable value to each of them.

For more information about User Engineering, refer to:

http://www-306.ibm.com/ibm/easy/eou_ext.nsf/publish/1996

3.4.7 Create a projection of the ROI/TCO of the solution

The business leaders should be extremely interested in the solution's return on their investment (ROI) and the total cost of ownership (TCO).

There are two types of ROI that should be projected: tangible (hard) and intangible (soft). Tangible ROI can be quantified with dollars or numbers and it is typically associated with headcount savings, system count reduction, server consolidation, and department closures. Intangible ROI generally cannot be projected or have its progress measured in exact financial or other numeric terms. It involves such concepts as satisfaction, perception, usability, vision, and so on.

Total cost of Ownership (TCO) is an analysis of solution expense and projected savings over time.

3.5 Validate the On Demand Business solution design

This task involves validating the On Demand Business solution design by mapping it to the business requirements stated by the client. The focus should be on all of the aspects of design that have a direct relationship with meeting the client's stated business requirements. In addition, it is also extremely beneficial to map the solution design to the client's long-term business objectives.

A skilled Solution Designer will solicit and incorporate feedback by reviewing all deliverables - (initially in draft form) with the client. Being included in the review gives the client the opportunity to offer input, become a contributor, and claim ownership in the work performed.

Client validation and approval is vital to the success of any solution design and implementation. There are many ways to obtain client approval. Below are two very effective ways:

- ▶ Reviewing a hardcopy design with the client
- ▶ Creating and demonstrating a prototype

For either way, during the review of the proposed workflow, the Solution Designer should post the client's business requirements, and encourage the participants to verify that the proposed workflow satisfies the posted business requirements. Although this sounds like a simple exercise, the proposed workflow may be significantly different from the client's existing workflow.

Because changing the proposed workflow during solution development can significantly impact project time, this confirmation step during design is critical to the success of the project. Sign-off (approval) of the design should be obtained from the client.

There are several ways to validate the work flow with business needs; one of them would be to use Rational® Unified Process® (RUP®) business modeling. Using RUP requires the development of a domain model and the use of entity life cycles. Refer to 5.2, “Rational Unified Process (RUP)” on page 61 for information about RUP.

Regardless of whether hard copy deliverables or a prototype is reviewed with the client, the design review process itself should be iterative.

The subtasks of this task that are described in this section are as follows:

- ▶ Validate that the solution design meets the functional requirements.
- ▶ Validate that the design meets the non-functional requirements.
- ▶ Validate that the solution design meets the quality of service and Service Level Agreements.
- ▶ Validate that the design functions within the client's infrastructure.
- ▶ Validate that the design functions within the client's business processes.
- ▶ Validate that the solution moves the client further along the On Demand Business continuum.
- ▶ Validate that the solution design meets the client's long-term requirements.
- ▶ Participate in a Solution Assurance Review.

3.5.1 Validate that the solution design meets the functional requirements

Any initiative or program a business undertakes to acquire new capabilities comprises a set of stakeholder requirements defined in business terms. The business requirements give rise to projects that are executed to acquire the new capabilities by either modifying existing business processes and IT functions or designing new business processes and introducing new IT functions. This subtask ensures that the solution design meets the IT functional requirements and in turn the original stakeholder business requirements.

The Systems Engineering and Architecture (SE&A) group within IBM Global Services offers a formal approach for validating that an On Demand Business solution design meets the functional requirements. At a high level, their method provides a formal way to decompose business requirements into system level requirements and to define system level requirements into its component level requirements.

For more information, contact the Systems Engineering & Architecture team within IBM Global Services, which you can do at the following Web link:

<http://www-1.ibm.com/services/us/index.wss/offering/bcs/a1002462>

3.5.2 Validate that the design meets the non-functional requirements

Non-functional requirements (NFR) describe the quality characteristics, both runtime and non-runtime, of the solution. Examples of NFRs include volume/performance, reliability/availability, disaster recovery, and security. Certain runtime, non-functional requirements like volume and performance can be validated through performance and stress testing. Other NFRs, such as reliability and availability, can be measured in production via a variety of mechanisms and by comparing the post-production performance of the system to the agreed upon operational metrics. Client requirements for specific technical and network

architecture can be validated readily by scheduling client audits and walkthroughs. Based on the criticality and strategic importance of the system as defined by the business, disaster recovery plans can be put in place to ensure business continuity in the face of natural or other disasters and emergencies. Acquiring On Demand Business infrastructure capabilities (described in Chapter 7, “On Demand Operating Environment: the infrastructure management capabilities” on page 85) helps ensure that the non-functional requirements will be addressed.

3.5.3 Validate that the solution design meets the quality of service and Service Level Agreements

The client's Service Level Agreement is a contract with their users to provide availability, capacity, scalability, performance, and security of the system.

3.5.4 Validate that the design functions within the client's infrastructure

This subtask can be done by ensuring that the design addresses and meets the following core infrastructure capabilities:

- ▶ Availability of resources
- ▶ Security
- ▶ Optimization
- ▶ Provisioning
- ▶ Orchestration
- ▶ Business services management
- ▶ Virtualization of resources across servers, storage, distributed systems/grid, and the network

Chapter 7, “On Demand Operating Environment: the infrastructure management capabilities” on page 85 provides details about these infrastructure capabilities.

3.5.5 Validate that the design functions within the client's business processes

An On Demand Business transformation solution should integrate an enterprise's existing business processes end to end. In addition, key segments of the processes should be automated with IT applications. IBM offers a structured approach for validating that the solution design functions within the designed business processes. It links and validates business process designs to business strategies and objectives, business rules, and related application architectures. The Systems Engineering and Architecture group in IBM can be contacted regarding these services, and be found at:

<http://www-1.ibm.com/services/us/index.wss/offering/bcs/a1002462>

3.5.6 Validate that the solution moves the client further along the On Demand Business continuum

IBM has clearly established that On Demand Business is a more of a journey than a state reached at any given point in time. The path any company takes to acquire new capabilities is subjective to the enterprise, the enterprise industry sector, and the maturity of current capabilities. The assessment of where a given enterprise is on the On Demand Business continuum can only be done by clearly establishing certain key operational performance milestones and comparing the actual performance of the enterprise to those metrics or milestones.

Examples of operational metrics include employee productivity, key business process cycle times, and client retention rates. Achieving these performance metrics involve business innovation, so the transformation to an On Demand business happens in stages that deliver both near term and long term results.

3.5.7 Validate that the solution design meets the client's long-term requirements

The purpose of this subtask is to demonstrate the longevity of the solution that will be designed. Many solutions are developed to meet an immediate business need, but are later made obsolete due to long-term business requirements. The unfortunate result is that the solution may need to be completely redesigned or discarded.

3.5.8 Participate in a Solution Assurance Review

The Solution Assurance Review (SAR) is a technical inspection of a completed solution design. The SAR is used to review proposed solutions with a client, and it helps minimize risk. The purpose of the SAR is to ensure that the proposed solution will deliver the features that are expected, that it is technically possible to implement, and that it will meet the client's requirements and expectations. It is important to include technical Subject Matter Experts (SMEs) who were not involved in the solution design.

3.6 Present the solution to the client

Frequently, the Solution Designer is not the individual who presents the solution to the client. The solution proposal will include many different facets of the bid, with the On Demand Business solution design being just one of those facets. A key role in this critical phase is to support the team that is making the presentation. This is done by:

- ▶ Mapping the design considerations to the proposal evaluation criteria to ensure the proposal meets or exceeds the client standards for acceptance
- ▶ Providing the design expertise to answer client questions and deal with client concerns
- ▶ Supporting trade-off and alternative proposals
- ▶ Assisting in justifying the business value of the proposed On Demand Business solution

The subtasks of this task that are described in this section are as follows:

- ▶ Tailor the presentation to the client audience (for example, business or IT)
- ▶ Use appropriate delivery methods to present the solution
- ▶ Provide design-related evidence for the ROI and TCO of the solution
- ▶ Address client feedback regarding the design

3.6.1 Tailor the presentation to the client audience

While the need to be an On Demand Business addresses a wide spectrum of business requirements, the solution presentation to the client is the first and most important deliverable in order for a client to buy into the proposed solution. The Solution Designer who presents (or helps create) the solution must be an effective presenter and a good listener and must be comfortable discussing client specific business and technology knowledge, as well as key issues facing the client. After introductions have been made at the beginning of the presentation, the presentation should begin by validating client objectives and highlighting solution goals and time lines for the desired solution. This ensures that there is consensus

among business, IT, operations, and the solution provider on the business objectives the client is seeking to achieve.

Depending on the chosen architecture methodology that the Solution Designer has selected, the presentation must include, at a minimum, client specific business and system context diagrams, key use cases, sequence diagrams, solution architecture principles and decisions, as well as technology selections. The solution architecture decisions must include relevant justification (such as cost, maturity of technology, functional and integration requirements, and so on) and, if relevant, other options that were considered to arrive at the decision.

It is critical that the Solution Designer know the makeup of the audience ahead of time. This will further allow the Solution Designer to customize the presentation to fit the audience expectations. Near the end of the presentation, it is a good idea to receive client feedback and define the next steps, followed by distributing the presentation handouts.

3.6.2 Use appropriate delivery methods to present the solution

A solution walk through (via a combination of a presentation and handouts) or a prototype are approaches that the Solution Designer can use to validate design requirements.

A prototype is most often used during the selling process. A company may challenge whether the solution is able to be delivered as claimed. In such situations, a prototype provides an opportunity to prove that the solution will indeed be able to achieve the client's business objectives.

Because the prototype is usually demonstrated to a client during the sales process, it is often very unsophisticated and based solely on business requirements. However, prototypes are often improved throughout the course of the project using an iterative design approach in order to validate that the solution is on track. In fact, rather than attempting to maintain both a prototype and a development/testing environment, they may be one in the same, resulting in a prototype that evolves into the solution walk through.

3.6.3 Provide design-related evidence for the ROI and TCO of the solution

The ROI and TCO goals were previously projected by the Solution Designer (See 3.4.7, "Create a projection of the ROI/TCO of the solution" on page 41). For this subtask, the Solution Designer should show that the ROI and TCO solution goals will be met.

3.6.4 Address client feedback regarding the design

The Solution Designer must satisfactorily address all major design issues and significant comments raised by the client. This may require that the Solution Designer return to any or all of the previous tasks to clarify business requirements or make changes to the design. Significant changes can require re-validation. A meeting to confirm that the client's feedback has been incorporated should be held. An approval of the final solution design should be obtained from the client prior to proceeding on to solution implementation.

3.7 Assist the project management team with implementation and deployment

After the solution design has been approved and the project turned over to a project manager, the Solution Designer might think that their responsibilities have ended. However, this is often not the case, as the Solution Designer's skills are needed from time-to-time during the implementation phase of the project. For example, the Solution Designer should assist the project management team to:

- ▶ Establish rough estimates of the time and resources (people and technology) required
- ▶ Highlight the potential risk to the project introduced by design factors
- ▶ Assist with establishing acceptance criteria and project endpoint
- ▶ Review the statement of work to ensure that it meets the technical specification
- ▶ Provide technical guidance on an on-call basis during implementation
- ▶ Review acceptance test results
- ▶ Verify that the On Demand Business solution meets client objectives.

The Solution Designer should see that the above types of information are documented in a Solution Readiness Plan, which could include the following sections:

Business goals: See 3.2.1, "Determine what business goals the client is trying to achieve" on page 26.

Communications plan: Reflects all the direct and indirect parties involved with the project and describes who is responsible for every aspect of the implementation. This plan should also describe the escalation process in case of problems. This may be as simple as a listing of names, telephone numbers, and project responsibilities.

Education plan: Assesses the skills needed for successful implementation, current client skills, and the steps to close all identified skill gaps.

Support Plan: Covers what support the client will receive and from whom during the implementation.

Backup and recovery plan: Identifies the necessity for backup and recovery, how backup and recovery impact the client's internal service level agreements, and who is responsible for backup and recovery.

Systems management plan: Details how the client will deploy, maintain, and track software; it covers such items as configuration, operations, performance, availability, storage, and security.

Rollout plan and schedule: Includes all the individual plans listed previously with a schedule and priority attached to each activity. Laying out the activities and their schedule helps the client to visually see and understand the time lines and dependencies of their project implementation.

Service level agreements: Agreements for providing availability, capacity, scalability, performance, and security of the system.

Dependencies: States the assumptions of the availability of people and other resources that are critical to the success of the solution's implementation.

The subtasks of this task that are described in this section are as follows:

- ▶ Engage relevant services/resources to deploy the solution.
- ▶ Provide guidance on project calls or meetings.
- ▶ Provide input into the cost, time, and resource estimates.

3.7.1 Engage relevant services/resources to deploy the solution

The Solution Designer may advise the solution development/deployment team from time to time on services and resources. For example, during the development cycle, the deployment team may encounter solution performance issues. The Solution Designer can help resolve these issues by providing appropriate technical material or referring them to an expert or a specific IT service offering. The Solution Designer can also provide guidance on a specific area (for example, networking or security and privacy) when the deployment team lacks specific skills for handling it.

3.7.2 Provide guidance on project calls or meetings

The Solution Designer should have a big-picture view of the business, the solution being implemented, and the business and technical requirements that the solution will address. Their value during implementation is to remind implementers of the key business problems that the solution must solve, the reasons behind solution design decisions that were made, the most critical design factors, and measures that will indicate solution success. Often, the higher-level view of these items gets lost in implementation details, so the Solution Designer can be there to keep the implementation team focused and not straying from important objectives.

3.7.3 Provide input into the cost, time, and resource estimates

A Solution Designer can provide help to the project management team in the areas of cost, time, and resources. The Solution Designer is in a unique position to help because he or she will know the technical architecture, business needs, and the solution options that were considered for the project.

On Demand Business basics

There are two primary starting points for helping a business become on demand: business transformation and the On Demand Operating Environment (ODOE), which has two main categories: integration and infrastructure management. This part provides conceptual and reference information about both. It also contains information about Business Driven Development and IBM techniques for designing On Demand Business solutions.

We will discuss the following topics:

- ▶ Chapter 4, “Business transformation” on page 51
- ▶ Chapter 5, “Business driven development” on page 59
- ▶ Chapter 6, “On Demand Operating Environment: integration capabilities” on page 67
- ▶ Chapter 7, “On Demand Operating Environment: the infrastructure management capabilities” on page 85
- ▶ Chapter 8, “On Demand Operating Environment: architectural elements” on page 117
- ▶ Chapter 9, “Security in an On Demand Business” on page 129
- ▶ Chapter 10, “IBM techniques for On Demand Business” on page 147



Business transformation

This chapter provides information about business transformation by covering the following topics:

- ▶ Business transformation basics
- ▶ Transformation approaches
- ▶ Application and process integration
- ▶ Business Process Management (BPM)

4.1 Business transformation

As shown in Figure 4-1, for a business to become an On Demand Business, the entry point could be either business transformation or On Demand Operating Environment. In this section, several possible approaches are provided for beginning the On Demand Business journey, with business transformation as the entry point.

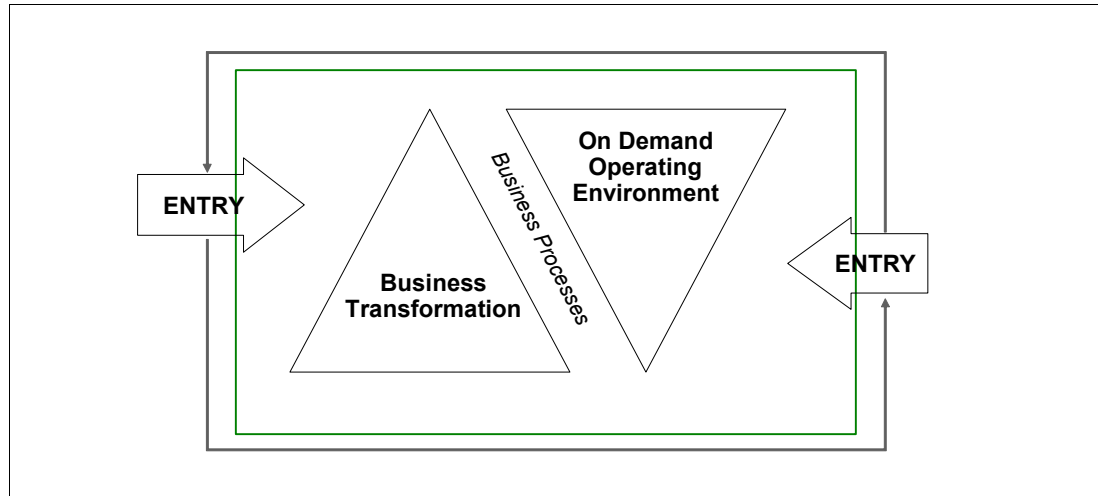


Figure 4-1 Business transformation as a starting point

Business transformation in basic terms is about acquiring or enhancing business capabilities through new levels of integration between processes and technology. New or enhanced business capabilities can be realized by fundamentally improving or streamlining the current business processes. From the IT perspective, the level of integration is much broader, requiring horizontal business integration as opposed to point to point connectivity between application components and application integration. The transformation itself could be done within one organizational unit of an enterprise or within an entire enterprise or across enterprises between an enterprise and its partners, suppliers, and clients. The key to On Demand Business transformation is taking an approach that is always business process-centric rather than IT Architecture or application-centric.

Business transformation also means reusing existing IT assets in a completely new way to achieve new business results. A business can become an On Demand Business if it can transform its core processes to be more focused and resilient.

Organizations undertake projects to acquire new business capabilities. The business capability can be viewed within the context of a business process, which involves a sequence of steps or events that need to occur to achieve a desired business result, which ultimately realizes the capability. Examples of business capabilities include enabling commerce on the Web and enabling e-commerce for key business partners. A business capability is realized by the following:

- ▶ A collection of applications that provide functions to automate specific steps in the business process
- ▶ A set of users interacting with those applications executing the tasks from an operational perspective.

On Demand Business is not what an enterprise buys but what an enterprise becomes. Business transformation is implemented by understanding the existing business capabilities and acquiring new capabilities by following a sequencing plan. It is more of an evolution that

supports the transformation journey rather than something that happens through one project or initiative. One key component of that is to understand the current as-is key business processes and designing the to be business processes. The gaps between the as-is and to be processes potentially give rise to new business requirements. As part of an On Demand Business transformation, solutions need to be defined for those requirements that resulted from the gap analysis. IT Architecture is the other vital component that provides the foundation for the delivering the solution by automating the newly designed key business processes.

4.2 Transformation approaches

This section reviews the following approaches for accomplishing a business transformation:

- ▶ The Open Group Architecture Framework (TOGAF) and the Architecture Development Method (ADM)
- ▶ Business process modeling
- ▶ Service-oriented Modeling Method and Architecture (SOMA)
- ▶ Unified Modeling Language (UML)

4.2.1 The Open Group Architecture Framework (TOGAF)

The Open Group Architecture Framework (TOGAF) is an industry standard architecture framework that may be used freely by any organization wishing to develop an information systems architecture for use within that organization. TOGAF has been developed and continuously evolved since the mid-90s by representatives of some of the world's leading IT client and vendor organizations, working in The Open Group's Architecture Forum. More information about TOGAF can be found at:

<http://www.opengroup.org/architecture/togaf/>

TOGAF has an Enterprise Architecture Development Method (ADM) that identifies an Enterprise Architecture to be comprised of four major domains: Business Architecture, Application Architecture, Information/Data Architecture, and Technology Architecture. For achieving effective business transformation, all four domains must work in synchronization. Application, Information, and Technology Architectures can be considered as the three key pillars of an On Demand Operating Environment (ODOE), and the Business Architecture forms the basis or starting point for business transformation. See Chapter 7, "On Demand Operating Environment: the infrastructure management capabilities" on page 85 and Chapter 8, "On Demand Operating Environment: architectural elements" on page 117 for more information about the ODOE.

TOGAF consists of three main parts:

1. The TOGAF Architecture Development Method (ADM), which explains how to derive an organization-specific enterprise architecture that addresses business requirements. The ADM provides:
 - A reliable, proven way of developing the architecture
 - Architecture views that enable the architect to ensure that a complex set of requirements are adequately addressed
 - Links to practical case studies
 - Guidelines on tools for architecture development

2. The Enterprise Continuum, which is a virtual repository of all the architecture assets (models, patterns, architecture descriptions, and so on) that exist both within the enterprise and in the IT industry at large, which the enterprise considers itself to have available for the development of architectures. At relevant places throughout the TOGAF ADM, there are reminders to consider which architecture assets from the Enterprise Continuum the architect should use, if any. TOGAF itself provides two reference models for consideration for inclusion in an enterprise's own Enterprise Continuum:
 - The TOGAF Foundation Architecture: An architecture of generic services and functions that provides a foundation on which specific architectures and architectural building blocks can be built. This Foundation Architecture in turn includes:
 - The TOGAF Technical Reference Model (TRM), which provides a model and taxonomy of generic platform services
 - The TOGAF Standards Information Base (SIB), a database of open industry standards that can be used to define the particular services and other components of an enterprise-specific architecture
 - The Integrated Information Infrastructure Reference Model, which is based on the TOGAF Foundation Architecture, and is specifically aimed at helping the design of architectures that enable and support the vision of information flow without boundaries.
3. The TOGAF Resource Base, which is a set of resources (guidelines, templates, background information, and so on) to help the architect in the use of the ADM. As a comprehensive, open method for Enterprise Architecture, TOGAF 8 complements, and can be used in conjunction with, other frameworks that are more focused on specific deliverables for particular vertical sectors, such as government, defense, and finance.

The ADM process

TOGAF's ADM consists of an eight step iterative process. The steps are as follows:

1. Architecture vision
2. Business architecture
3. Information system architectures
4. Technology architecture
5. Opportunities and solutions
6. Migration planning
7. Implementation governance
8. Architecture change management

One of the key steps in the Architecture Development cycle is Step 2, the Business Architecture. A knowledge of the business architecture is an important prerequisite for architecture work in the application, data, and technology domains, and should therefore be done early in the process.

One of the techniques to generate the business requirements to achieve the business transformation that ADM prescribes is through the development of business scenarios. Inherently, the scenarios imply the technical requirements that the other three architecture domains need to support or fulfill. The reference architecture within the enterprise continuum could be a good starting point to approach the business scenarios.

TOGAF ADM has the following seven step method to document the business scenarios and this will help you get an insight into the baseline business architecture. From this baseline, the target architecture can be reached by essentially implementing business transformation

initiatives. Business scenario developing techniques can be used iteratively at different levels of detail in the hierarchical decomposition of the Business Architecture.

1. Problem: Identify, document, and rank the problem that is driving the project.
2. Business and technical environments: Document, as high-level architecture models, the business and technical environment where the problem situation is occurring.
3. Objectives and Measures of Success: Identify and document desired objectives and the results of handling the problems successfully.
4. Human Actors: Identify human actors and their place in business model, the human participants, and their roles.
5. Computer Actors: Identify computer actors and their place in technology model, the computing elements, and their roles.
6. Roles and Responsibilities: Identify and document roles, responsibilities and measures of success per actor, the required scripts per actor, and the desired results of handling the situation properly.
7. Refine: Check for fitness for the purpose of inspiring subsequent architecture work, and refine only if necessary.

4.2.2 Business Process Modeling

Another way of generating requirements to support the business transformation is via business process modeling (BPM). BPM takes *as is* business processes along with *to be* business processes and allows businesses to view their complex challenges in new ways. There are many desktop software applications and commercial tools available that support BPM, such as WebSphere Business Integrator.

According to TOGAF, business processes can also be depicted as activity models to describe the functions associated with the enterprise's business activities, and the information exchange between various application components within an enterprise or between application systems within an enterprise and its clients, partners, and suppliers. Activity models are hierarchical in nature and they provide another way of depicting the business processes; they include input triggered by specific business events, business controls, and outputs. Activity models also include users, tools, and resources used to execute the activities from an operational sense. The Business Process Management Initiative (BPMI.org) is an organization that is defining standards for business process modeling, including a language with which to specify business processes, their tasks/steps, and the documents produced.

Another more familiar way of modeling business processes could be done using UML, such as use case diagrams and activity diagrams. Use case models can be developed from the process perspective or system perspective.

4.2.3 Service-oriented Modeling Method and Architecture (SOMA)

Another approach to business transformation is provided in the Service-oriented Modeling Method and Architecture (SOMA) proposed by Ali Arsanjani within IBM. SOMA serves as a bridge linking the business modeling world of CBM (described in 10.1.1, "Component Business Model" on page 148) with the systematic activities and work products that design a Service-oriented Architecture (described in 6.2.1, "Service-oriented architecture (SOA)" on page 71). The output of a SOMA engagement is a services model that defines the most appropriate service-oriented architecture design for supporting the company's core business processes.

SOMA is a seven step method to decompose an entire enterprise to discover the enterprise's business capabilities as a service and how they should be implemented.

Table 4-1 shows the relationship between the business and IT views of a given organization.

Table 4-1 Relationship between business and IT views

Business view	IT Architecture view
Business domain.	Enterprise IT architecture landscape.
Key business process.	Key functional area.
Subprocess.	IT solution space.
Made up of business components that include business objects, people and applications.	Made up of application components.
Business Use cases.	System use cases (establishes solution context for realizing the Service from IT perspective).
For each use case, identify all the variables within the use case and determine the use case scenarios. (Note: Ensure that the use case scenario provides full coverage of all the variables.)	For each use case, evaluate and determine appropriate test cases for E2E (end-to-end) System Integration Testing. (Business use cases are the basis for test cases.)
Collaboration of business components to fulfill a business process.	Collaboration of application components automate the same business process.
Component specification from the business perspective includes functions each component needs to support, interfaces between components, and information flows/exchanges through those interfaces.	Component specifications from the technological perspective include detailed system requirement specifications, interface specifications, data specifications/data model, and so on.
Gaps in the business processes identify additional functions.	Fulfilled by individual components to automate those functions.

In regards to TOGAF ADM, the IT architecture view can be can be split into a logical view and a physical view. The logical view is represented by the application architecture domain and the physical view is comprised of the infrastructure (hardware and software components, including servers, network, and so on) that hosts the application components.

4.2.4 Unified Modeling Language (UML)

UML is a standardized modeling language consisting of an integrated set of diagrams developed to help system and software developers accomplish the tasks of specify, visualize, construct, and document.

UML diagrams are modeled representations of real-world ideas. For program designers, architects, and developers, UML diagrams are an important tool in the process of creating well-crafted useful software. UML satisfies an important need of *modeling* in software and system development. Models are easily understood and allow you to concentrate on the big picture. They help you see and solve the more important problems and help you avoid distracting details that you can handle later. When you model, you construct an abstraction of an existing real-world system or of the system you envision. You are allowed to ask questions and get answers prior to the cost of developing the system.

UML is based on the Object Management Group's (OMG) Model-Driven Architecture (MDA). OMG's purpose is to enable interworking between complementary tools and foster

specialization of tools and methods through a set of standards in support of model-driven development. For further information about MDA, refer to:

<http://www.omg.org/mda/>

MDA provides an open, vendor-neutral approach to the challenge of business and technology change. MDA aims to separate business or application logic from underlying platform technology. Platform-independent applications built using MDA standards can be used on a range of open and proprietary platforms, including Common Object Request Broker Architecture (CORBA), Java™ 2 Platform, Enterprise Edition (J2EE), Microsoft .NET, and Web services or other Web-based platforms.

UML with Version 2.0 defines new user lever constructs that improve UML support for component-based development, architectural specifications, and advanced behavioral modeling techniques using interactions, state machines, and activity diagrams. UML 2.0 allows you to capture and communicate all aspects of an application architecture using a standard notation that is recognized by many different stakeholders.

UML 2.0 provides a visual modeling environment to meet today's software technology and communication needs. The scope of UML also has broadened. It no longer is used only to describe software systems. With the Service-oriented Architecture (SOA) and MDA initiatives, UML must evolve to describe and automate business processes, as well as become a language to develop platform-independent systems. Ultimately, UML is a framework of tools to help deliver better software.

4.2.5 Application and process integration

A key to a successful business transformation is to ensure effective integration between the IT applications and business process while acquiring the new capabilities. New capabilities delivered strictly from an IT perspective without considering how each of the applications fits into an enterprise's business process framework may not serve any useful purpose. Ultimately, the new capabilities are realized by the execution of the business processes where various user groups interact with the IT systems. Focusing on the user interactions with the IT systems to execute operational steps or activities of a business process while implementing business transformation will help us identify additional requirements that may have been overlooked before.

Ashish Deshpande, CTO and founder of MetaServer, Inc. has published an article, *Business Process integration, One Piece At a Time*, found at http://www.bptrends.com/deliver_file.cfm?fileType=publication&fileName=03%2D04%20ART%20BPI%20One%20Piece%20At%20A%20Time%20%2D%20Deshpande%20Epdf that talks about how narrowing the scope of the application functions can be key to achieving effective business process integration. Typically, during business process and application integration, not all functions provided by the application is exposed for integration. Therefore, selecting specific system functionality to integrate can be a quick way to approach application and process integration.

In *Business Process Management, A Rigorous Approach* by Ould, Martyn Ould talks about a challenge where information systems need to change with the changing business processes. He views information or data as secondary to business processes and as the lubricants of a business process. As the business processes are integrated within and across enterprises, it is important for system developers to know about those processes and the changes they are undergoing. Additionally, Martyn says, a business process management system (BPMS) helps us work with our processes by making those processes *the subject matter of the system*. The process is not something implied. It is not something separate from the system. The system is not just giving people the information they need to carry on the process that is

happening elsewhere. An information system is to all intents and purposes a bucket with information in it. It is essentially ignorant of the process being operated, simply allowing appropriate people appropriate access to the information in it, perhaps with some simple business rules attached. The BPMS, on the other hand, is where the process is mediated.

4.3 Business Process Management (BPM)

Business Process Management (BPM) is a business approach to manage the complete life cycle of a business process that includes process design, process deployment, execution, management, and optimization. BPM is much more than a streamlined workflow and forms a basis for understanding what is done wrong or right within an enterprise through current business process understanding. The thought behind BPM is to provide the necessary tools for business analysts so that they can manage their own business processes without depending on complex IT that exists to automate such business processes. One good example is the use and management of personal e-mails without having to understand the complexities of internet and the network of computers.

The Business Process Management System (BPMS) to effectively manage the business processes during its life cycle is the new platform that drives a business process centric approach to transforming a business and acquiring new capabilities. With BPMS, the fundamental paradigm is the business process and not a collection of IT technologies. BPMS enables new means of creating business processes. BPMS for business process management is, in a way, similar to DBMS for data management via SQL enabled standards based management of business data.

BPMI.org (the Business Process Management Initiative) is a non-profit corporation that aims to empower companies of all sizes, across all industries, to develop and operate business processes that span multiple applications and business partners, behind the firewall and over the Internet. The Initiative's core objective is to promote and develop open, complete, and royalty free XML-based standards that support and enable Business Process Management (BPM) in industry.

You can find information about the Standard BPM Stack at:

<http://bpmi.org/aboutus.htm>

You can visit this Web site and follow the Workgroups link to learn about the latest about these standards.



Business driven development

This chapter describes business driven development. It contains the following subtopics:

- ▶ Definition of business driven development
- ▶ Rational Unified Process (RUP)
- ▶ Life cycle of an On Demand Business service

5.1 A definition of business driven development

As shown in Figure 5-1, business driven development:

- ▶ Unifies business and software teams with model-driven business integration
- ▶ Improves productivity by providing a choice of modeling paradigms
- ▶ Makes reuse practical with asset-based development

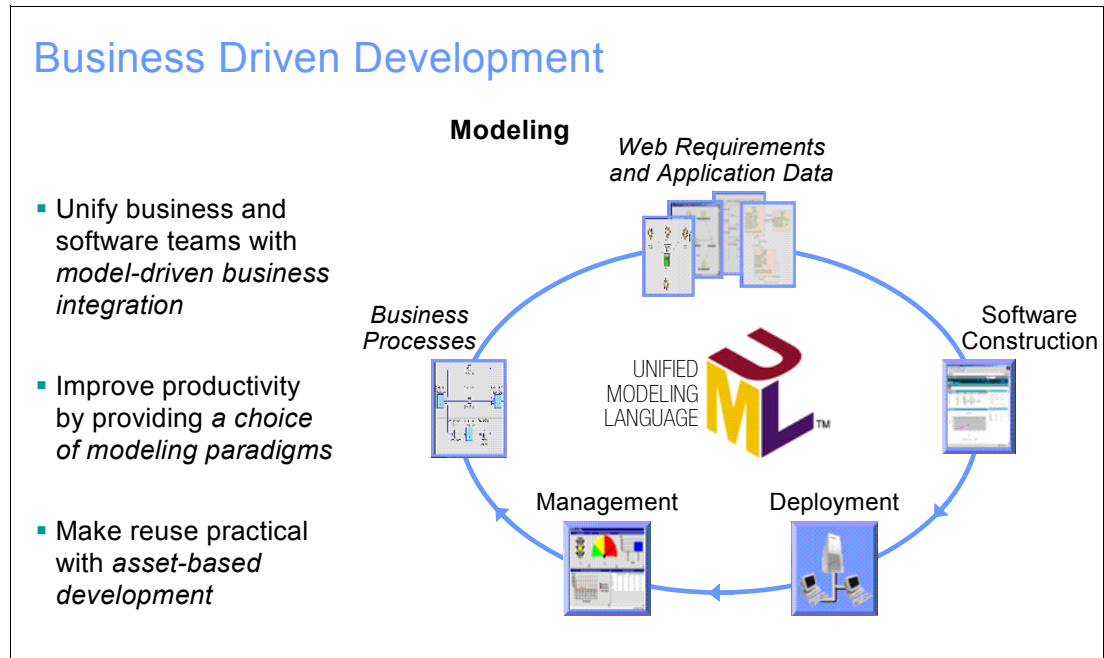


Figure 5-1 Business driven development

Business Driven Development is based on business processes, modeling, Web requirements and application data, software construction, deployment, and management.

Figure 5-2 on page 61 shows the IBM Business Driven Development Process. This core of this process is UML, which is described in 4.2.4, “Unified Modeling Language (UML)” on page 56.

IBM Business Driven Development Process

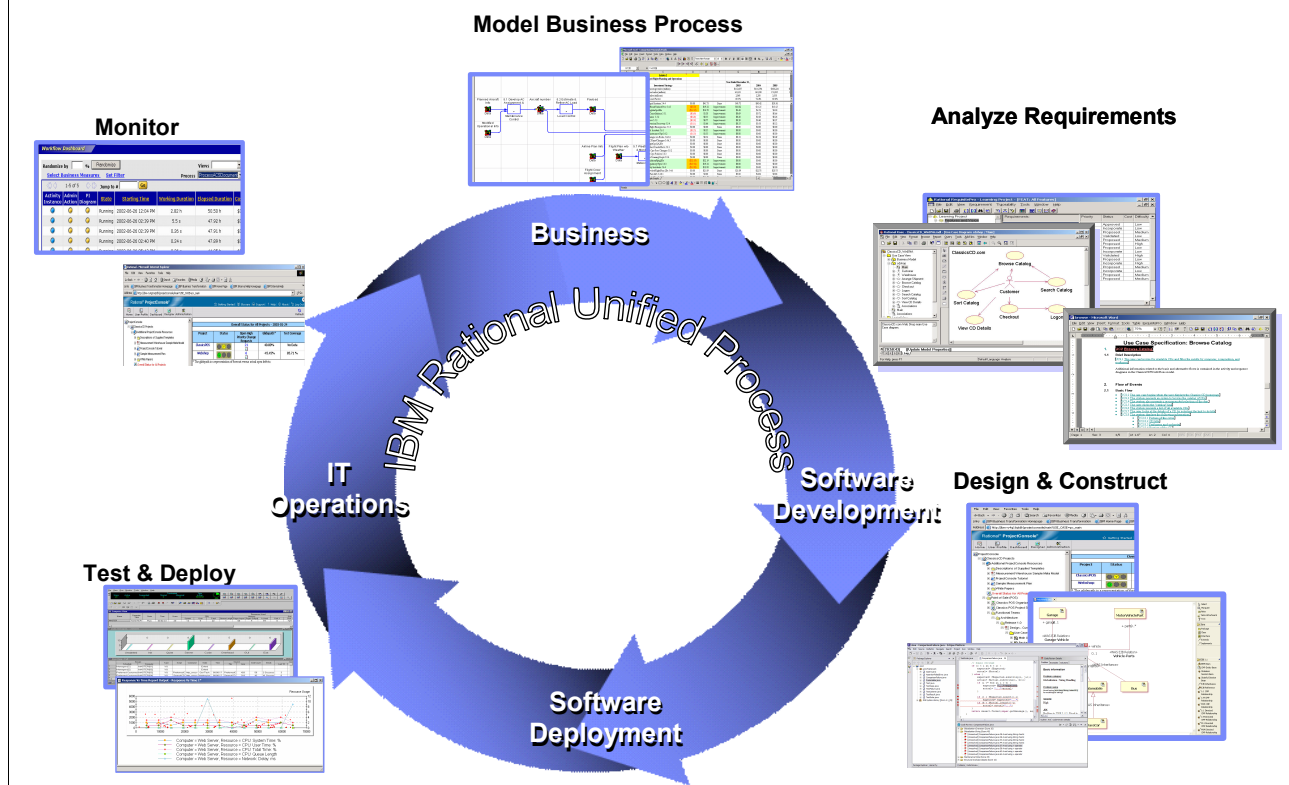


Figure 5-2 IBM Business Driven Development Process

The IBM Business Driven Development Process is based on IBM Rational Unified Process (RUP), which is described in the following section.

5.2 Rational Unified Process (RUP)

RUP is a configurable software development process platform that delivers proven best practices and a configurable architecture. It enables you to select and deploy only the process components you need for each stage of your project.

The RUP platform includes:

- ▶ Tools for configuring RUP for your project's specific needs
- ▶ Tools for turning your own internal knowledge into process components
- ▶ Powerful and customizable Web-based deployment tools

RUP is a flexible software development process platform that will help you deliver customized yet consistent process guidance to your project team:

- ▶ Industry-proven best practices: With best practices adopted in thousands of projects worldwide and taught as part of the curricula in hundreds of universities, the RUP methodology is fast becoming the *de facto* industry standard software development process.

- ▶ **Process made practical:** Unlike other commercial methodologies, the RUP platform makes process practical with knowledge assets and guidance to help you “jump start.” project planning, get team members up to speed and working consistently, and put your customized process into action.
- ▶ **Adapts to your project needs:** Only the RUP platform provides a configurable process framework that enables you to select and deploy the specific process components you need to provide a consistent yet customized process for each team and project.

One of the central best practices of RUP is the notion of developing iteratively. RUP organizes projects in terms of disciplines and phases, each consisting of one or more iterations. With the iterative approach, the emphasis of each workflow will vary throughout the life cycle. The iterative approach helps you address risk early and continuously, through demonstrable progress and frequent, executable releases.

5.3 Life cycle of an On Demand Business service

The On Demand Business paradigm is greatly realized through SOA. This allows for the construction of service-based ecosystems that enable efficient transformations of business environments. Business services externalize functional units of reuse in an adaptable and efficient way. Applications are able to be created by aggregating those services as needed, forming robust solutions that can be reconfigured as market forces require. Business services represent entities that satisfy a specific business function. They hide implementation details from the clients, allowing for the reduction of overall complexity.

Open Standards allow SOA to be implemented in a way that encourages interoperability, help avoid vendor lock-in, and ensures future access to information. All of these translate into lower long term costs, as current investment would be better used for insurance against change.

Both SOA and Open Standards encourage the design of more resilient business domains, but unless the right tools are used, those designs would remain as just plans. An end-to-end tools strategy is necessary to address the various actions that can be taken throughout the solution life cycle. Those tools need to be able to easily exchange information as the development efforts progress and integrate with the selected infrastructure.

SOA, Open Standards, and End-to-End Tools Support serve as a backdrop for the execution of the life cycle of an On Demand Business Service, which is shown in Figure 5-3 on page 63. Conceptually, there are three major efforts that need to occur: determine the services, assemble the services into solutions and deploy them into an operational model. The latter two can be further decomposed, thus forming, in total, the five phases described below. These phases will be defined at a conceptual level; the specifics for the participating roles or artifacts used for input/output is beyond the scope of this redbook.

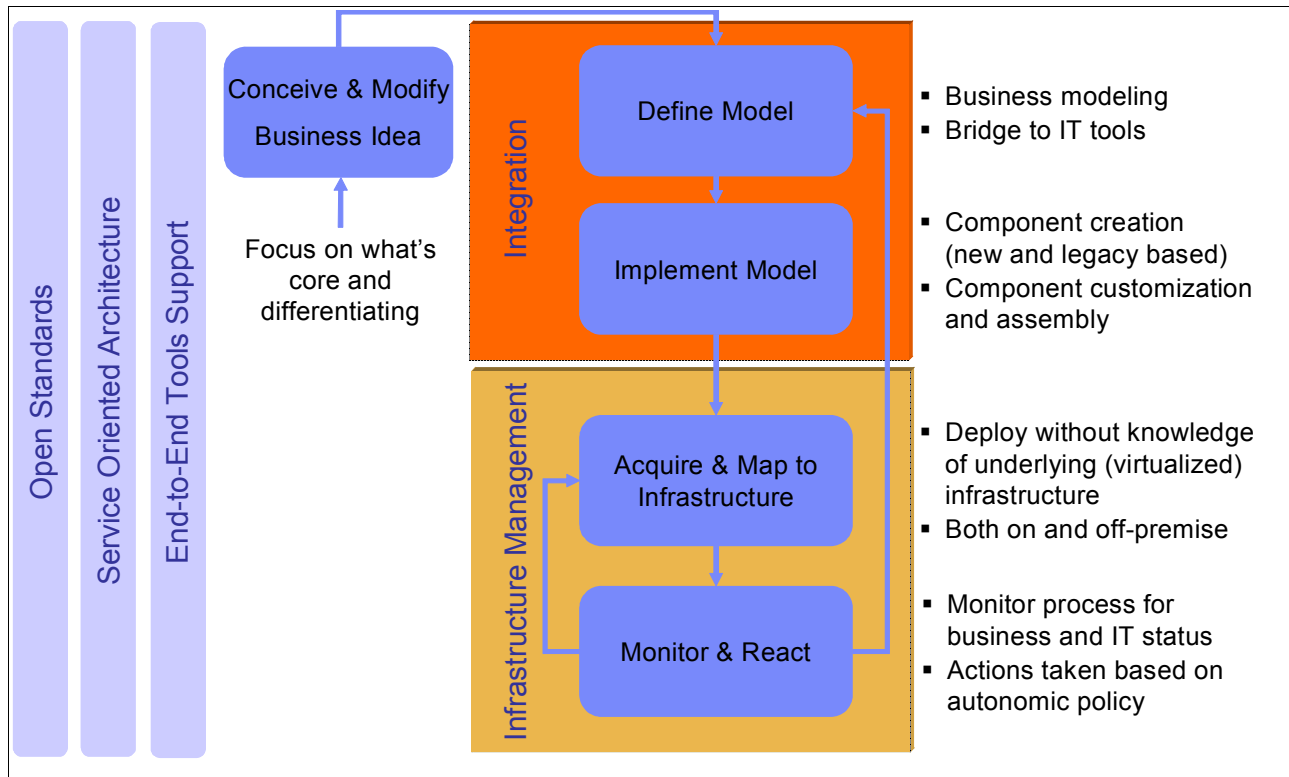


Figure 5-3 On Demand Business Service Life cycle overview

5.3.1 Conceive and modify business idea

In order for a company to effectively optimize its business execution, it needs to clearly understand its business domain. Such a context is composed of a variety of areas; extending functionality within those areas is done by services, which are grouped into logical sets of components.

The methods used to aggregate functionality into components and prioritize them for realization is beyond our scope here. Popular approaches to use are the Component Business Method (CBM) or Service-oriented Method Architecture (SOMA). For information about CBM, refer to 10.1.1, “Component Business Model” on page 148. For information about SOMA, refer to 10.1.4, “Services Oriented Modeling and Architecture (SOMA)” on page 156

The various work products defined at this phase are typically maintained as text documents, including specific domain depiction diagrams that focus on the context of the application at hand.

5.3.2 Define model

Once the business has been subdivided into specific domain areas, each with various service exposing components, a model is defined to capture the various conceptual elements. It serves as a component-based view of the application, encouraging further refactoring and allowing for further dependencies identification.

At this point, simulations of actual client information requests can be executed. These activities should take the key performance indicators specified during the Conceive and Modify phase into consideration.

The various strategies used to define the application are done in a way that facilitates its implementation. This includes following well-known pattern approaches (for example, patterns for On Demand Business) or proven reference architectures (for example, On Demand Business Reference Architecture). These allow for the creation of templates that can be further transformed into specific technology implementations (for example, by following a Model Driven Development approach).

The various models defined at this phase are typically managed through a business process focused tool like WebSphere Business Integrator Modeler and the more general UML diagrams through Rational Software Architect (using the Rational Software Modeler functionality).

5.3.3 Implement model

The services discussed so far have been defined at a business, domain-defined granularity. They are the realizations of business optimization techniques. When it comes time to transform such designs into implementations, the more advantageous granularity might not have been exposed. Also, the right semantic elements needed for a specific solution might be scattered across various components. In order to provide more focused, cleaner application units, the business services exposed through business components are aggregated into composite services. This allows for the decoupling of business specific changes from application-centric services; if the business changes, the application will be impacted in a more manageable manner.

This flexibility is one of the core advantages that Service-oriented Architecture brings to the table, which, together with the combination of using open standards, provides a powerful approach for ensuring an enterprise for change.

As shown in the SOA context diagram in Figure 5-4, those application level services can then be further composed using process choreography patterns. The process choreographies can be thought of coarser grained, application specific composite elements, which allow for the more controlled reuse of complex interactions. These workflows could encapsulate the logic required for human interactions as well.

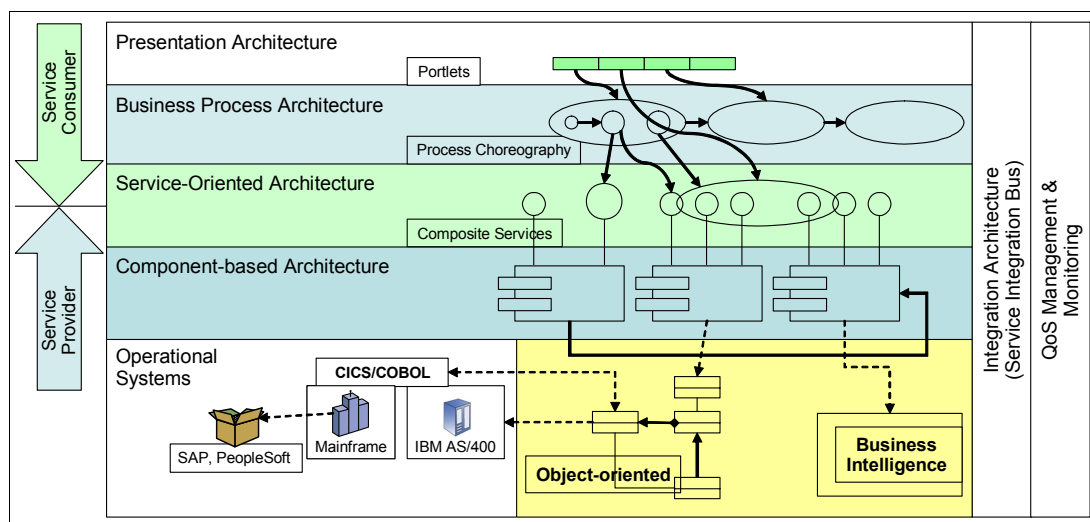


Figure 5-4 SOA context diagram

A layer above the choreographies would be a set of client-facing presentation elements that reuse the functionality offered by the flows through well defined interfaces.

Connecting all of these architectural layers (business, application, flow, and presentation components) is the Enterprise Service Bus, which is described in 8.10, “Enterprise Service Bus (ESB)” on page 122.

In this phase, the previously defined models are transformed into specific realizations, through the help of well-integrated tools. For example, WebSphere Business Integrator Modeler is able to export BPEL models straight into WebSphere Studio Application Developer Integration Edition. Also, specific UML models defined in Rational Software Architect can be transformed into specific J2EE components. These generated entities are able to be further influenced by the tool-driven application of previously defined design patterns.

5.3.4 Acquire and map to infrastructure

The various elements composing a given On Demand Business application are deployed into the ODOE, which externalizes infrastructure services hosted on a virtualized environment.

Requirements are mapped to resources through the definition of application specific policies, which allow the flexible management of service affinities. These policies enable the fulfillment of non-behavioral requirements by notifying the runtime which specific services are needed by the application. This occurs at deployment time.

It should be noted that the ODOE enables the access and use of services even if they are physically distributed or defined in other organizations. This allows, for example, for the logical integration of services delivered by an outsourced organization with some in-house developed core processes.

Middleware deployment is currently supported by products such as Tivoli Software Distribution. Application development is supported through target-middleware specific features. For example, WebSphere Application Server externalizes a set of management objects through a TCL language-based scripting API called WSAAdmin. Everything that can be done through the administrative console is enabled to be automated. From here, more complex solutions involving change control software, like Rational's ClearCase®, are possible.

5.3.5 Monitor and react

After the On Demand Business application has been deployed to the ODOE, robust monitoring activities become a core prerequisite of a successful production environment. In order to enable such functionality, it is important to recall the key performance indicators identified during the business component delivery efforts and make them the key directives for metric gathering. The data collected can then be analyzed in order to extract knowledge that may affect future plans. Once the analysis and integration of feedback is completed, any needed resulting actions are executed. This set of activities reoccur as often as needed, typically as frequently as new metrics trigger specific actions. In an On Demand Business system, this pattern of autonomic behavior is called a MAPE (monitor, analysis, plan, execute) loop.

An ODOE reacts according to specific service level agreements specified for a given application. For example, in the situation in which an application is considered a premium client, the monitoring infrastructure would route its requests to destinations in the topology that would ensure the fulfillment of its defined thresholds. In the case where the target resource is not able to achieve such level, the ODOE monitoring capabilities would sense that and trigger actions that would, through the help of ODOE virtualization services, rearrange underline resources as needed. All of this would occur without the application sensing it or being modified in any way.

The various monitoring tools used in this phase should be able to tightly integrate with the runtime and development environments. Tivoli delivers a set of monitoring offerings, specific to MQ, WebSphere and other middleware. Information from such monitoring is able to be integrated also with the Rational set of tools, thus delivering a cohesive monitoring experience.



On Demand Operating Environment: integration capabilities

The capabilities of the On Demand Operating Environment (ODOE) are grouped into two categories: *integration*, which focuses on attaining *business flexibility* through the integration of people, processes, and information, and *infrastructure management*, which focuses on attaining IT simplification.

This chapter describes these unique capabilities of integration:

- ▶ Business modeling
- ▶ Process transformation
- ▶ Application and information integration
- ▶ Access and collaboration
- ▶ Business process management

Refer to Chapter 8, “On Demand Operating Environment: architectural elements” on page 117 for information about infrastructure management.

6.1 Integration

Integration is about connecting people, processes, and information in a way that allows companies to become more flexible in regards to the dynamics of the markets, clients, and competitors around them. Integration is the efficient and flexible combination of resources to optimize operations across and beyond the enterprise. It includes securely connecting people with relevant information, accelerating the implementation of end-to-end business processes to help streamline operations, and consolidating information to provide a single view of data.

Figure 6-1 (left column) shows the ODOE integration capabilities that are described in this chapter.

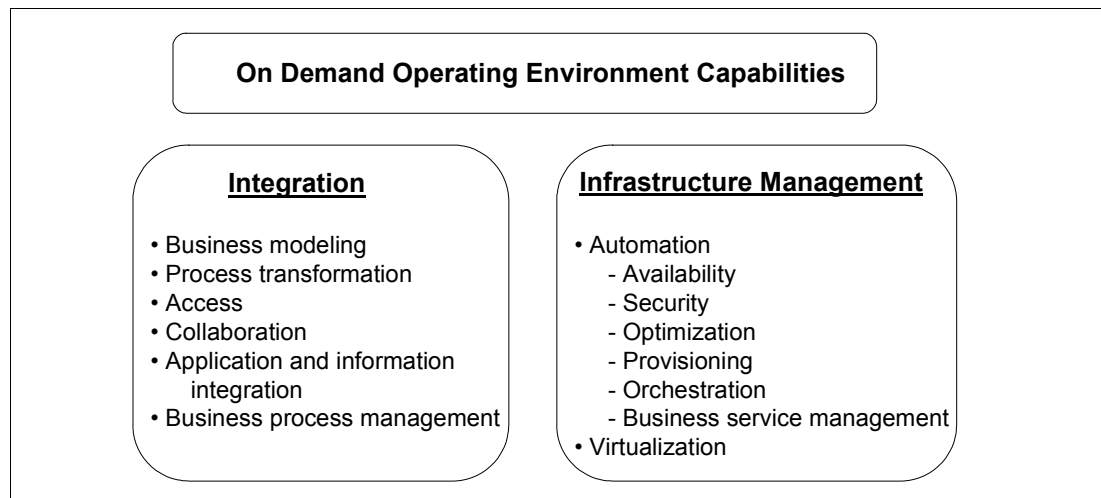


Figure 6-1 On Demand Operating Environment capabilities

6.1.1 Business modeling

Business modeling enables the graphical depiction and simulation of a business process, including task descriptions, required resources, and decision points.

Business services are the various externalized functional service offerings that have been defined, configured, and deployed in the operating environment. A business service is the touch point for the user or the external system, and is in reality the aggregated view of the business process that is choreographed out of functional services. Business services are identified and defined through such mechanisms as Component Business Modeling (CBM).

Component Business Model

The idea of viewing a business as a set of interlocking components (and the underlying notions of specialization and reusability) is not exactly new. Businesses have always understood that to be as efficient, effective, and profitable as possible (to maintain their competitive edge), they have to create exceedingly responsive and flexible organizations, comprised of components with discrete services.

Yet traditional business modeling, based on mapping individual business processes, does not incorporate this idea. And so until now, building flexible organizations has been a challenge. But changing business practices are enabling flexibility: new collaborative relationships with clients, suppliers, and competitors, and outsourcing of processes and functions. And changes in technology (global connectivity provided by the Net, the spread of open standards, and the emergence of Web services, grid, and others) are allowing businesses to structure themselves and provide a breadth and scale of services in ways that would have been difficult

or impossible before. As business and technology evolve to enable these more flexible organizations, the need has arisen for the matching evolution of techniques with which to view them.

IBM has met that need, and simplified the mechanism so that it is easier for clients to understand. Where process-based modeling can produce hundreds of documents that map individual processes, component-based modeling yields a single-page model that can be used to illustrate strategic, financial, or transformational ideas across a company's operations.

The Component Business Model is an innovative and powerful analytical tool to help the client address their critical business and technology issues.

Business components provide the ability to easily view the enterprise through a number of different “lenses,” simply by changing the criteria by which components are evaluated, for example, financial, strategic fit, organizational, and technical. It enables IBM to deliver on the “full equation”, bringing together our research, services, and technology capabilities around client issues to create substantial and sustainable value in a single integrated framework.

CBM allows organizations to be seen as autonomous, manageable components. This helps decision-makers to “disentangle” the organization, cutting through historical boundaries arising along organizational, product, channel, geography, and application lines. The new clarity is the basis for better decision making.

Each component is a grouping of the people, technology, and resources delivering specific business value and potentially able to operate independently (in the extreme, as a separate company or part of another company). Components have well-defined interfaces, allowing them to interact smoothly with each other and to be “snapped” in and out at will, like building blocks.

For more information about CBM, refer to Chapter 5, “Business driven development” on page 59

6.1.2 Process transformation

Process Transformation enables existing applications and information to be reused in new ways to quickly respond to change.

- ▶ Process transformation: Automates data and business processes
- ▶ Synchronizes, manages, and enables reuse of data across the enterprise
- ▶ Extends and protects IT investments by transforming legacy application functions into reusable, sharable business components
- ▶ Provides tools to help maximize the predictability, efficiency, and quality of mixed workload development and deployment environments supported by IBM @server zSeries® and IBM @server iSeries™ applications and Java applications

IBM products available to help with process transformation are as follows:

- ▶ IBM WebSphere Studio
- ▶ IBM WebSphere Studio Asset Analyzer
- ▶ IBM WebSphere Business Integration Adapters
- ▶ IBM WebSphere Studio Application Monitor
- ▶ IBM WebSphere Studio Workload Simulator
- ▶ IBM Host Access Transformation Services
- ▶ IBM Host Access Client Package
- ▶ IBM CICS® Transaction Gateway
- ▶ IBM IMS™ Connect

- ▶ IBM DB2 Information Integrator
- ▶ IBM DB2 Information Integrator Classic Federation
- ▶ IBM DB2 Content Manager

6.1.3 Application and information integration

Application and information integration provides seamless connectivity between new and existing applications, data, and processes and reacts in real time to the most relevant information by ensuring a seamless flow of information.

On Demand Business solution design should ensure data consistency and integrity. The integration of applications and information in a possible heterogeneous environment is a very complex undertaking and great care needs to be taken to ensure the following benefits of the effort occurs:

- ▶ Avoiding the same data in several sources
- ▶ A design that could make a merge of new applications easier
- ▶ Increase in reliability and the quality of data
- ▶ Decrease in the complexity of the interaction between process and services that are handled by distinct applications

6.1.4 Access and collaboration

Access and collaboration improves communication and collaboration between clients, partners, and suppliers within the enterprise and beyond.

As information flows seamlessly through the business process, many individuals need to interact with that information in different ways. The information must be presented to the user in a personalized manner depending upon their role and the task they are performing. This presentation must be dynamic, allowing changes to be presented in real time. In addition, the tools used must mirror the dynamic and *ad hoc* nature of collaborative and project teams as they come together to work on a particular problem or issue that may represent a step or task in a larger work flow or decision-making context. These collaborative and *ad hoc* workflow capabilities are key to providing flexibility to the people in an On Demand Business as they complete the tasks in a business process.

6.1.5 Business Process Management

Business Process Management (BPM) is a business approach to manage the complete life cycle of a business process that includes process design, process deployment, execution, management, and optimization. BPM is much more than a streamlined workflow and forms a basis for understanding what is done wrong or right within an enterprise through current business process understanding. The thought behind BPM is to provide the necessary tools at the hands of business analysts so that they can manage their own business processes without depending on complex IT that exists to automate such business processes. One good example is the use and management of personal e-mails without having to understand the complexities of internet and the network of computers.

The Business Process Management System (BPMS) to effectively manage the business processes during its life cycle is the new platform that drives a business process-centric approach to transforming a business and acquiring new capabilities. With BPMS, the fundamental paradigm is the business process and not a collection of IT technologies. BPMS enables new means of creating business processes. BPMS for business process

management is, in a way, similar to DBMS for data management via SQL enabled standards based management of business data.

BPMI.org (the Business Process Management Initiative) is a non-profit corporation that aims to empower companies of all sizes, across all industries, to develop and operate business processes that span multiple applications and business partners, behind the firewall and over the Internet. The Initiative's core objective is to promote and develop open, complete, and royalty free XML-based standards that support and enable Business Process Management (BPM) in industry.

You can find information about the Standard BPM Stack is found at:

<http://bpmi.org/aboutus.htm>

You can visit this Web site and follow the Workgroups link to learn about the latest about these standards.

6.2 Integration architecture/technologies

This section describes the following three architecture/technologies that are fundamental to ODOE integration capabilities:

- ▶ Service-oriented Architecture (SOA)
- ▶ Connected Information (CI)
- ▶ Workplace

6.2.1 Service-oriented architecture (SOA)

Service-oriented architecture (SOA) is an approach to defining integration architectures based on the concept of a *service*. Applications collaborate by invoking each others services, which in turn can be composed into larger sequences in order to implement business processes.

Drivers for SOA

The main driver for SOA is to define an architectural approach that assists in the flexible integration of IT systems. Organizations spend a considerable amount of time and money trying to achieve rapid, flexible integration of IT systems across all elements of the business cycle. The drivers behind this objective include:

- ▶ Increasing the speed at which businesses can implement new products and processes, can change existing ones, or can recombine them in new ways
- ▶ Reducing implementation and ownership costs of IT systems and the integration between them
- ▶ Enabling flexible pricing models by outsourcing more fine-grained elements of the business than were previously possible or by moving from fixed to variable pricing based on transaction volumes
- ▶ Simplifying the integration work that is required by mergers and acquisitions
- ▶ Achieving better IT utilization and return on investment
- ▶ Achieving implementation of business processes at a level that is independent from the applications and platforms that are used to support the processes

SOA prescribes a set of design principles and an architectural approach to achieve this rapid, flexible integration. In the following sections, we provide an overview of some of the elements in SOA that achieve this goal.

Definition of SOA

SOA is an integration architecture approach based on the concept of a service. The business and infrastructure functions that are required to build distributed systems are provided as services that collectively, or individually, deliver application functionality to either end-user applications or other services. SOA specifies that within any given architecture, there should be a consistent mechanism for services to communicate. That mechanism should be loosely coupled and support the use of explicit interfaces. SOA brings the benefits of loose coupling and encapsulation to integration at an enterprise level. It applies successful concepts proved by Object Oriented development, Component Based Design, and Enterprise Application Integration technology to an architectural approach for IT system integration.

Services are the building blocks to SOA, providing function out of which distributed systems can be built. Services can be invoked independently by either external or internal service consumers to process simple functions, or can be chained together to form more complex functionality and quickly devise new functionality.

By adopting an SOA approach and implementing it using supporting technologies, companies can build flexible systems that implement changing business processes quickly, and make extensive use of reusable components. This concept is presented in Figure 6-2 on page 73, which illustrates a company that wants to implement a new business process to support clients who place orders from a Web site. The company already has existing retail, warehouse, and billing systems. It would like to build the new process by reusing the functionality provided by those systems instead of either having to write new applications or build new interfaces to the existing systems. If the company has already adopted an SOA approach, it will have defined the interfaces to its existing systems in terms of the functions, or services, that they can offer to support building business processes. This facilitates the retailer easily integrating with their partners and vendors. All that is needed is an application that makes calls to the services to complete the new business process.

The SOA approach means companies are able to build horizontal business processes, integrating systems, people and processes from across the enterprise quickly and easily in response to changing business needs.

As shown in Figure 6-2 on page 73, existing systems can be used to implement new business processes that extend the use of the system beyond the processes they were originally written to support. This means the company is able to maximize previous IT investment by reusing existing IT systems without having to invest extensively to build new interfaces to the systems.

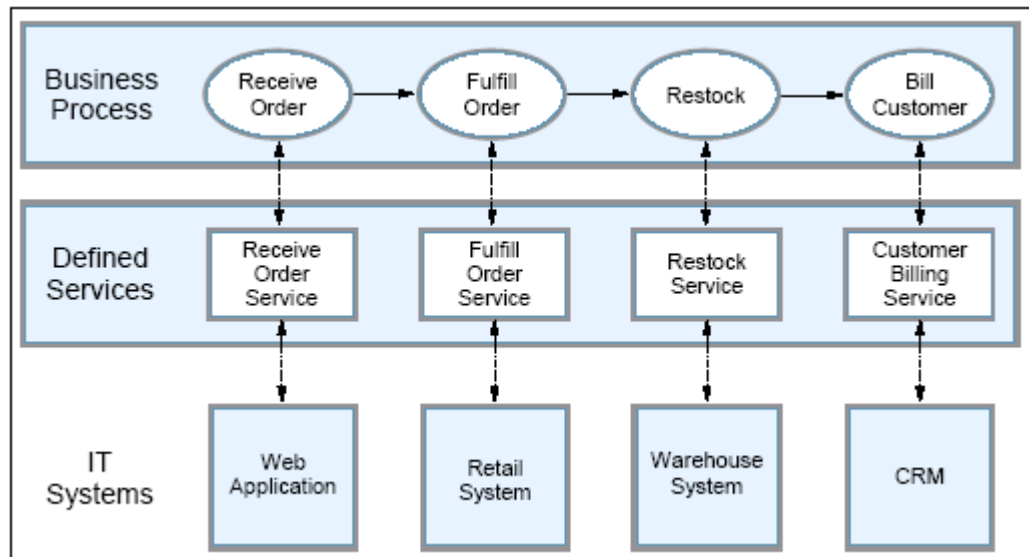


Figure 6-2 A service-oriented approach to building systems

On Demand Business and SOA

SOA plays a crucial role for companies trying to implement the IBM vision of On Demand Business. The IBM On Demand Business vision is to enable clients to succeed in an environment with an unprecedented rate of change. In an on demand world, companies need to be able to respond to any client requirement, opportunity, or threat quickly and easily. To succeed in this environment, a company must be able to implement new processes quickly while leveraging existing investments. From a business perspective, On Demand Business is about providing a way for companies to realign their business and technology environment to match the need for reusable business functionality.

SOA can be seen as an architectural enabler for On Demand Business. The basic relationship between SOA and On Demand Business is that SOA touches on the four key elements of On Demand Business, namely:

- ▶ Open standards
 - SOA provides a standard method of invoking services (business logic and functionality) for disparate organizations to share across network boundaries.
- ▶ Integration
 - Interfaces are provided to wrap service endpoints and ensure a system-independent architecture. This in turn promotes cross-industry communication and so integrates end-to-end both inside and outside of the enterprise.
 - SOAs can provide dynamic service discovery and binding, which means that service integration can occur on demand.
 - SOA provides an approach to integrate heterogeneous technologies inside an enterprise.
- ▶ Virtualization
 - A key principle of SOA is that services should be invoked by service consumers that are oblivious to service implementation details, including location, platform, and if appropriate to the business scenario, even the identity of the service provider.

- ▶ Automation
 - Technologies, such as grid technologies, that apply SOA principles to implementing infrastructure services that will provide an evolutionary approach to increased automation.

Definition of a service

Having outlined SOA as being an architectural approach to defining integration architectures based on services, it is important to define what is meant by a “service” in this context in order to fully describe SOA and understand what can be achieved by using it.

A service can be defined as any discrete function that can be offered to an external consumer. This can be an individual business function, or a collection of functions that together form a process.

There are many additional aspects to a service that must also be considered in the definition of a service within a SOA. The most commonly agreed-on aspects are:

- ▶ Services encapsulate reusable business function.
- ▶ Services are defined by explicit, implementation-independent interfaces.
- ▶ Services are invoked through communication protocols that stress location transparency and inter operability.

In this redbook, we will define an SOA as being defined by these commonly agreed aspects.

Reusable function

Any business function can be a service. SOA often focuses on business functions, but we will see that many technical functions may also be exposed as services. When defining functions, there are several levels of granularity that can be considered. Many descriptions of SOA refer to the use of “large-grained” services; however, some powerful counter-examples of successful, reusable, and fine-grained services exist. For example, `getBalance` is a very useful service, but hardly large-grained.

More realistically, there will be many useful levels of service granularity in most SOAs. For example, all of the following are services; however, they have different granularity. Some degree of choreography or aggregation is required between each granularity level for them to be integrated in an SOA:

- ▶ Technical Function Services: For example, `auditEvent`, `checkUserPassword`, and `checkUserAuthorization`
- ▶ Business Function Services: For example, `calculateDollarValueFromEuro`, and `getStockQuote`
- ▶ Business Transaction Services: For example, `checkOrderAvailability`, and `createBillingRecord`
- ▶ Business Process Services: For example, `openAccount`, `createStockOrder`, `reconcileAccount`, and `renewPolicy`

A service can be any business function. In an SOA, however, it is preferable that the function is genuinely reusable. The goal of a service in SOA is that it can be used and reused by one or more systems that participate in the architecture. For example, while the reuse of a Java logging API could be described as “design time” (when a decision is made to reuse an available package and bind it into application code), the intention of SOA is to achieve the reuse of services at:

- ▶ Runtime: Each service is deployed in one place and one place only, and remotely invoked by anything that must use it. The advantage of this approach is that changes to the service

(for example, to the calculation algorithm or the reference data it depends on) need only be applied in a single place.

- Deployment time service is built once but redeployed locally to each system or set of systems that must use it. The advantage of this approach is increased flexibility to achieve performance targets or to customize the service (perhaps according to geography).

The service definition should encapsulate the function well enough to make the reuse possible. The encapsulation of functions as services and their definition using interfaces enables the substitution of one service implementation for another. For example, the same service might be provided by multiple providers (such as a car insurance quote service, which might be provided by multiple insurance companies), and individual service consumers might be routed to individual service providers through some intermediary agent.

Granularity in SOA

The concept of granularity is used to mean several things in SOA, each of which is actually quite separate. We will not be greatly concerned with these issues, but it is worth identifying them:

- Level of abstraction of services: Is the service a high-level business process, a lower-level business sub-process or activity, or a very low level technical function?
- Granularity of service operations: How many operations are in the service? What determines which operations are collected together in a service?
- Granularity of service parameters: How are the input and output data of service operations expressed? SOA prefers a small number of large, structured parameters rather than a small number of primitive types.

Explicit implementation independent interfaces

The use of explicit interfaces to define and encapsulate service function is of particular importance to making services genuinely reusable. The interface should encapsulate only those aspects of process and behavior that are used in the interaction between the service consumer and the service provider. An explicit interface definition, or contract, is used to bind a service consumer and a service provider. It should specify only the mutual behavior required for the interaction, and nothing about the implementation of the consumer or the provider.

By explicitly defining the interaction in this way, those aspects of either system (for example, the platform they are based on) that are not part of the interaction are free to change without affecting the other system. This allows either system to change implementation or identity freely.

The use of explicit interfaces to define and encapsulate services function is illustrated in Figure 6-3 on page 76.

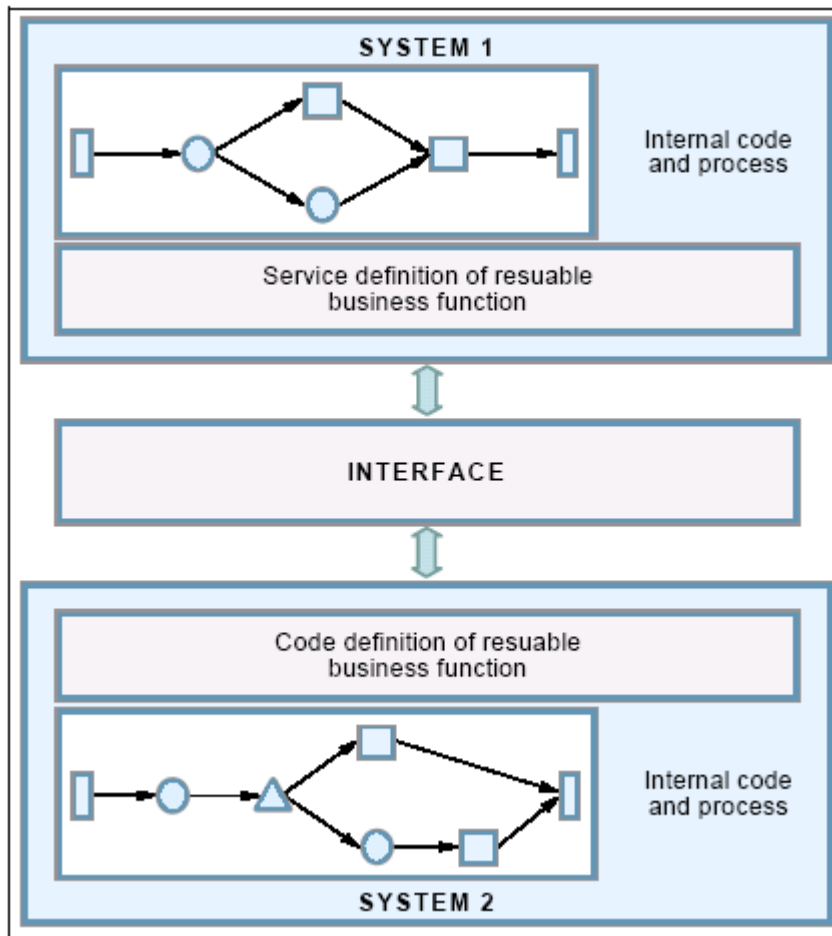


Figure 6-3 Service implementation of SOA

SOA and Web Services

Sometimes it is hard to discuss SOA without mentioning Web Services. This does not mean that SOA does not exist without Web Services and vice versa. It is possible to find solutions based on SOA that are based on EAI middleware like WebSphere Business Integration Message Broker or WebSphere MQ and other messaging systems; most of the solutions that are based only on Web Services consists of peer-to-peer services. SOA and Web Services can be tightly integrated. Mixing SOA and Web Services we can reach a very flexible and robust solution for many integration issues that we have nowadays.

Below are some benefits of SOA and Web Services:

- ▶ Web Services is an open standard already adopted by almost all of the IT industry and is based on XML (which is also an open standard) and HTTP.
- ▶ SOA is based on loosely coupled interfaces and works with service functions encapsulation.
- ▶ On a fully integrated SOA environment, it is not location dependent, so using Web Services enable a easy integration between different locations and even between different enterprises.
- ▶ Due to the Web Services specifications, it supports several protocols available on the market, such as HTTP, WebSphere MQ, and others, that improve the SOA utilization,

allowing it to be supported in several protocols and, consequently, several devices, helping solutions of complex user access and interaction.

- ▶ Web Services is a high-level communication protocol, which helps integration between different platforms.
- ▶ Web Services can leverage security models (HTTP and SOAP can use HTTP authentication or SSL authentication/encryption). Also, it is a framework consisting of several Web Services specifications; some of them are WS-Security, WS-Trust, WS-Privacy, and WS-Policy.
- ▶ Use of BPEL4WS to provide, in XML, the translation of functions defined in WSDL interfaces to business processes.
- ▶ To improve integrity control, you can rely on WS-Coordination specification and control the integrity of business transactions that consists of one or more Web Services interactions.

SOA is based on general techniques for designing and using reusable business functions through loosely coupled interfaces.

Web Services is a set of open standards that, working together, deliver a very reliable high level communication protocol, making it very resilient to SOA needs.

Working with SOA and Web Services together, you can extract the benefits of working with an already accepted industry standard, using a very mature and sophisticated technology.

6.2.2 Connected Information (CI)

Connected Information provides a set of capabilities to manage, manipulate, integrate, and provide insights across heterogeneous data sources.

CI is supported by:

- ▶ Data modeling and metadata management tools
- ▶ Optimized process and data movement choreography
- ▶ Data adapter capability
- ▶ Service and business event infrastructure
- ▶ Business workplace and presentation capability

As shown in Figure 6-4 on page 78, CI can integrate diverse business information across and beyond the enterprise:

- ▶ Data federation (Standard programming models, SQL, XQuery, Search, read/write access across diverse data and content sources, and extensible access)
- ▶ Data placement (Caching and replication over heterogeneous information)
- ▶ Data transformation (Leveraging SQL and XML standards, advanced search and mining, and metadata management and interchange)

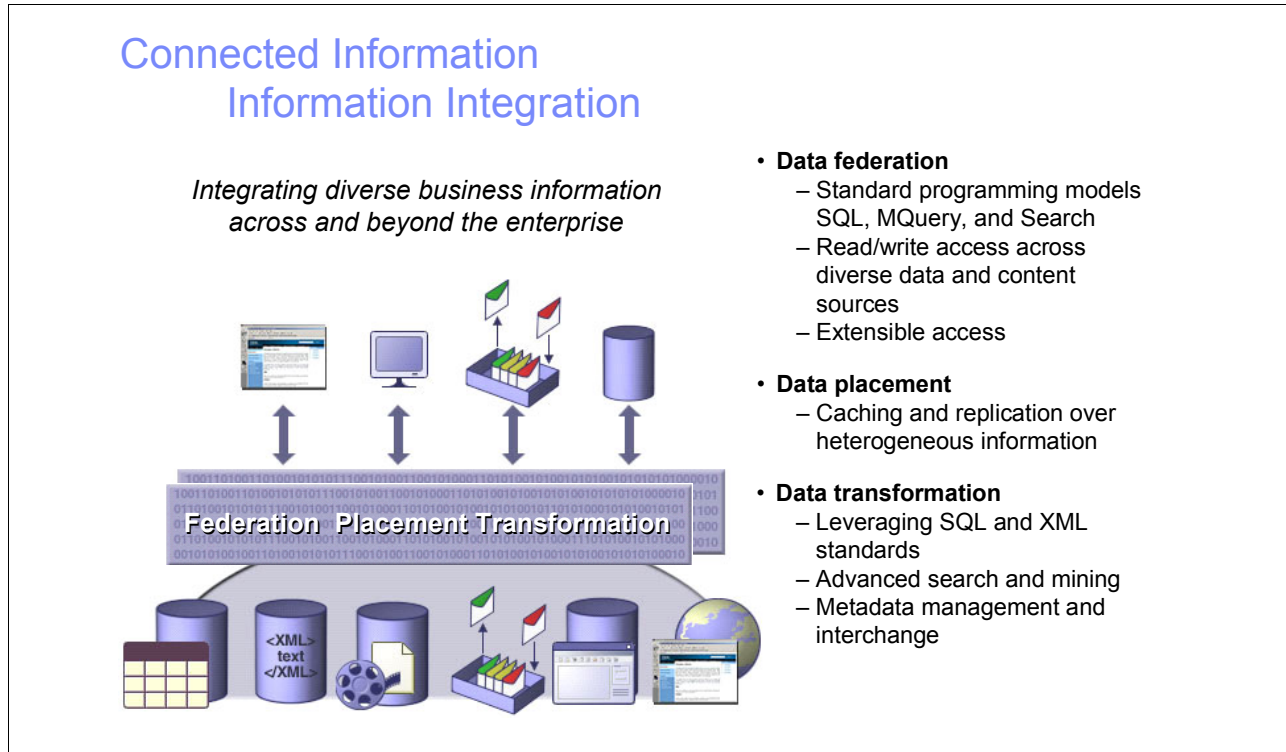


Figure 6-4 Connected information

6.2.3 Workplace

A workplace is the user interface to the On Demand Operating Environment. It is a dynamic environment that brings together all the collaborative tools, applications, and connections required by the business situation.

Workplaces aggregate capabilities based on the users identity and role, and is targeted to the business process context.

The workplaces are extensible by IT organizations and Industry Vertical Partners to increase organizational responsiveness and agility.

Workplaces can be accessed via a Browser (Portal Applications), Rich function, Server managed clients, or Devices.

Figure 6-5 on page 79 shows IBM Workplace Client Technology™ Goal.

IBM Workplace Client Technology Goal ...

Achieve rich client functionality at low total cost of ownership

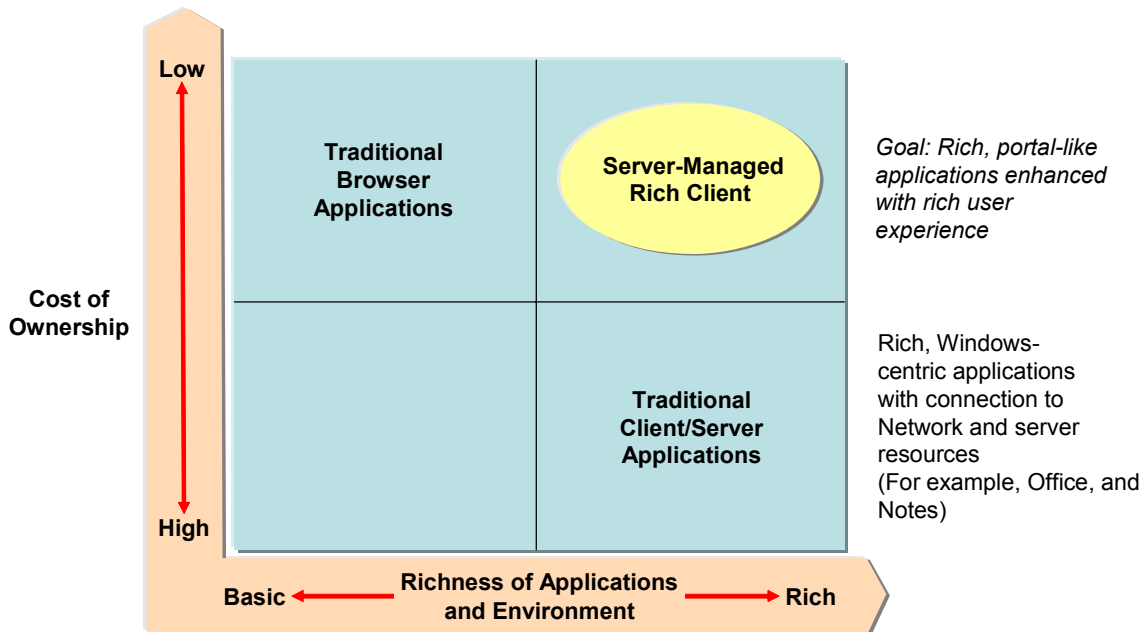


Figure 6-5 IBM Workplace client technology goal

The following is an overview of the IBM Workplace Client Technology:

- ▶ No Touch Deployment: Helps lower TCO
 - Server-managed delivery of rich clients to end-user communities
 - Centralized administration, setup, and client updates
 - Provision capabilities when needed on demand
- ▶ Rich user experience
 - Disconnected use and synchronization
 - Power of client software, that is, drag and drop, improved responsiveness, and UI control
 - Componentized and contextual
 - Embedded Doc Management On Demand Operating Environment
- ▶ Extensible client platform for:
 - Collaboration, including mail, calendaring and scheduling, instant messaging, team spaces
 - Document management
 - Existing Web, Java, .Net, and Notes applications
 - New applications: IBM and Business Partners
- ▶ Built-in data management and security features
 - Using local and server managed encrypted data stores
 - Robust policy managed access and control

- Choice and flexibility
 - Linux, Windows® and MacOS (planned) desktops
 - Manage office documents and Java, .Net, and C++ applications
 - Standards-based interoperability

Workplace collaboration

Every operating environment requires a mechanism for exposing the services of that environment to its users. In today's business, users are faced with increasing complexity of their working environment. They are asked to handle more situations, to be agile in the face of changing business conditions and models, and to react faster and more accurately to events and situations in their business environment. The user interface model must support this dynamic environment, and provide support to users trying to interface with the computing system that support their business needs.

For the IBM ODOE, the framework for reasoning about and describing the functions and capabilities of the user interface is known as the Workplace.

A Workplace is a dynamically created user interface that brings together all the business supporting applications, tools, and data, aggregated (composed) according to the user's role with respect to a business process, and primed (parameterized) by the active context of the business process.

For example, a workplace supporting the HR activities relating to the hiring of personnel might bring together a database of open positions, a database of candidates and skills, HR systems for issuing personnel requisitions, and dashboards or information sources that provide current information about the enterprises HR metrics.

However, rather than have a pallet of separate tools, a Workplace would bring together the tools required for a particular activity related to the hiring process in an order and composition suited to the specific activity. As the process of hiring a new employee progresses from the stage of interviewing, matching, and evaluating a candidate to that of actually bringing the selected candidate on board, the composition of the workplace changes. The tools switch from databases of resumes and discussion threads that collect opinions and feedback on a candidate to tools that enter a new employee into the HR system, initiate benefits, and perhaps even order the initial computer systems to support the new employee. Further, as the tools change, the information about the selected candidate automatically propagates to the next stage of the process. New employee information to feed the HR system is drawn from the business context accumulated during the interview phase. Position information is automatically filled in from the position description, and so on, even if these applications exist in independent IT systems.

Workplaces can be presented to the users over a variety of computing devices (workstations, disconnected laptops, hand held devices, and specially built computing appliances) that are most appropriate to the kind of interaction that the user needs.

What is IBM Workplace?

IBM Workplace, shown in Figure 6-6 on page 81, is the name for the overall framework of products that represent the front end of computing capabilities that are focused on making people more productive by enabling them to make more informed decisions and take targeted actions more quickly. Every company lists its employees as one of its greatest assets. Traditionally, the majority of IT budgets have been spend automating the structured way people work during a limited part of their day, and ignored the unstructured way people work during the majority of their day. The IBM workplace strategy provides a framework for pulling

structured and unstructured processes together to help individuals in their respective roles work together more efficiently, making their company more effective.

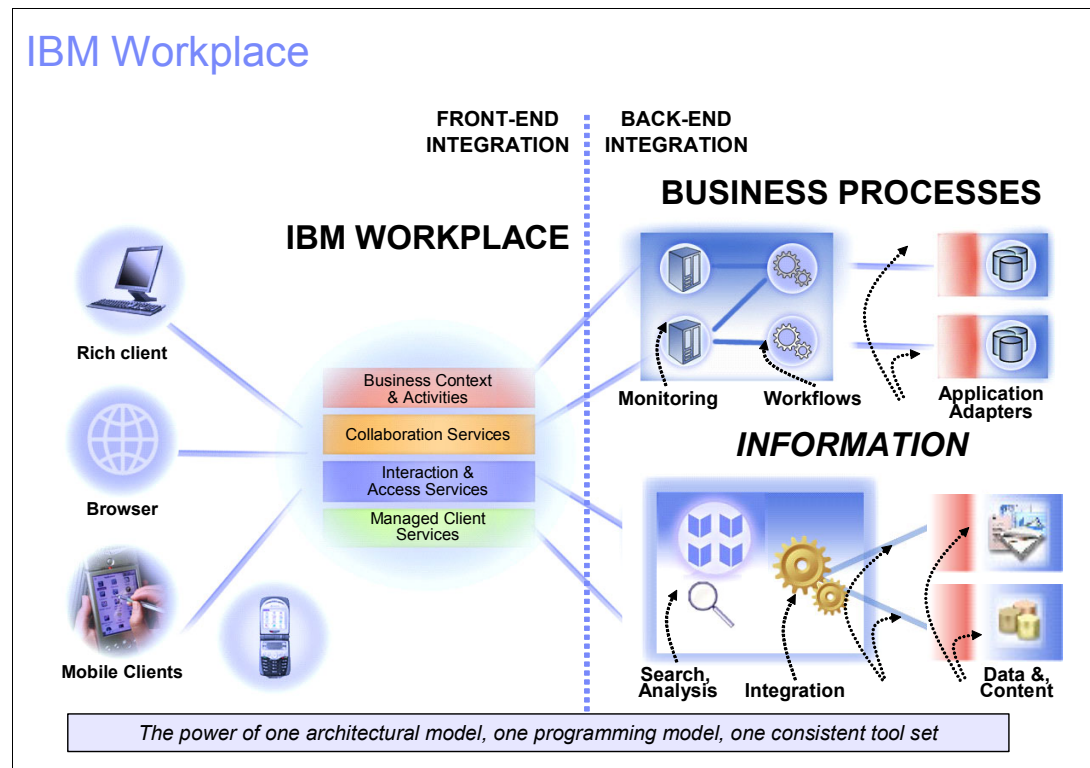


Figure 6-6 IBM Workplace

IBM Workplace Collaboration Services (WCS) is a new, adaptive work environment. WCS can be customized, based on users' unique roles in the organization. It is designed to transform productivity and enable people to make more informed decisions and take targeted actions faster.

IBM Workplace provides choice. WCS unifies all the tools and resources people need: documents, applications, productivity tools, and so on. It presents them via a single interface. Users can access Workplace environments anytime, anywhere, using enterprise desktops and laptops as well as pervasive and wireless devices. And users can do so even when disconnected.

IBM Workplace is flexible. WCS provides developers and administrators with the power of one architecture with one programming, deployment and management model. Plus, Workplace supports open standards (J2EE and Eclipse) and multiple client and server operating systems (Linux, MacOS, and Windows). This ensures existing and future IT investments can be intelligently integrated/exploited.

IBM Workplace provides a unique, On Demand Business network-centric delivery model. Custom WCS environments can be centrally deployed and managed no matter what the users' physical locations or points of access. As a result, organizations can uniquely combine the user productivity gains of desktop/device with the cost advantages of the network.

Benefits of IBM Workplace

Organizations will adopt the IBM Workplace model in differing configurations to serve particular sets of objectives, but all will benefit from the advantages inherent in the model itself.

Server-managed clients: The server-managed client model, which enables applications to be extended to a full spectrum of client types that are deployed, and managed from the server, allows applications to more easily follow a user across their day, whether the user is working from a disconnected laptop using a managed rich client, a connected workstation via a browser, or a mobile client via a “sometimes connected” mobile device. Server managed control of the user environment ensures that everyone has the latest applications and upgrades in a timely fashion.

Flexibility and choice: The standards-based flexibility and choice inherent in the IBM Workplace family of capabilities supports both preservation of existing investments and future extensibility. The IBM Workplace model adapts to the client's IT strategy by offering flexibility across operating systems, clients, document editors, and applications. The Linux, Windows, and (planned) MacOS environments will be supported. This flexibility facilitates streamlining business processes by incorporating clients, partners, and suppliers, and allows the IT infrastructure to grow and change with the evolving needs of the business.

Support for standards: Interoperability is achieved by the open standards approach, which enables easier and more effective integration with clients' existing IT investments. The extensible client platform permits extending the value of existing Web, Java, .Net, C++, and Notes applications, developing new applications, leveraging existing investments such as Office documents and Java.Net and C++ applications, and integrating processes across the enterprise.

Security: A robust policy of managed access and control with built-in data management and security features protect an organization's information assets. Applications utilizing IBM Workplace Client Technology benefit from local and server-managed encrypted data stores, in which the local data store can synchronize with the server, allowing for policies and ACLs to be applied. When documents are moved into the data store, they are effectively managed and are more secure than if left on the file server where they are vulnerable to attack.

Total Cost of Ownership: Simplification and server managed control of the user environment, with 'no touch' deployment, administration and client updates, radically reduces the costs of managing the environment. Standards-based interoperability with existing IT investments preserves their value and eliminates the costs of forced 'rip-and-replace' requirements. Provisioning capabilities to users 'on demand' based on role, rather than 'one size fits all' provisioning, further helps to lower the Total Cost of Ownership.

Productivity and responsiveness: The IBM Workplace model makes people more productive in the context of the business they do every day by giving them anytime, anywhere access to everything they need to do their jobs. Users benefit from the simplified user interface, easy access to applications, business processes and documents, componentized capabilities immediately available in the context of their work, a new rich user experience for Web-based applications, and disconnected use and synchronization of applications once tied to the network. The cumulative effect is increased organizational productivity, efficiency, and responsiveness.

IBM Workplace Product Family

The versatile, mix-and-match capabilities available for assembling an IBM Workplace environment are drawn from four industry-leading IBM product families, all based on a common technology platform. This platform also includes a new client technology that is changing the face of network-centric computing.

IBM Lotus Notes and Domino: These are time-tested messaging, application development, and collaboration products that can be integrated with a business environment.


IBM WebSphere Portal: A simplified work environment offered to users through personalized, integrated access to the information, applications, and business processes relevant to their jobs.

IBM Workplace Collaboration Services (formally known as Lotus Workplace): A family of integrated, standards-based products providing a single interface to the collaboration tools a user needs.

IBM Workplace Services Express: Collaborative Portal Solution for Small Businesses

IBM WebSphere Everyplace®: Mobile products and technologies extend applications and information to users working on remote devices, such as PDAs or cell phones.

IBM Workplace Client Technology: Innovative, standards-based technology for the development of server-managed business applications that can be accessed across a full range of user experiences, including rich clients.



On Demand Operating Environment: the infrastructure management capabilities

The capabilities of the On Demand Operating Environment (ODOE) are grouped into two categories: infrastructure management, which focuses on attaining IT simplification, and integration, which focuses on attaining business flexibility. This chapter describes the following components of infrastructure management.

- ▶ Automation
 - Availability
 - Security
 - Optimization
 - Provisioning
 - Orchestration
 - Business service management
- ▶ Virtualization

This chapter also describes autonomic computing, which provides the technology to enable information systems to be self-managing.

Refer to Chapter 6, “On Demand Operating Environment: integration capabilities” on page 67 for a description of integration. Because security is such a critical topic for On Demand Business, it is further described in Chapter 9, “Security in an On Demand Business” on page 129.

7.1 Infrastructure management

Figure 7-1 (right side) shows the ODOE infrastructure management capabilities that are described in this chapter.

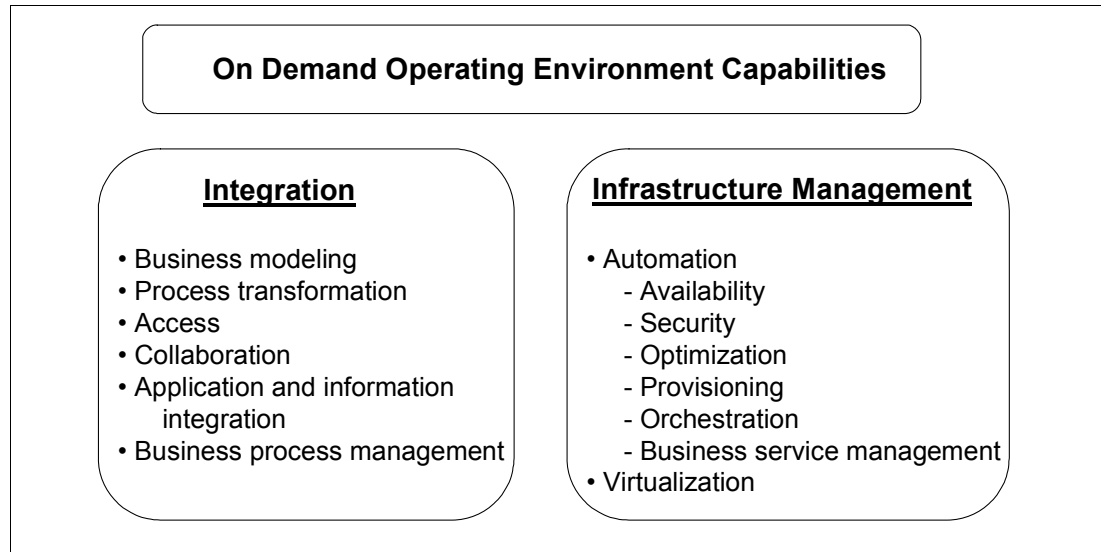


Figure 7-1 On Demand Operating Environment capabilities

In today's ever changing on demand business world, your client's IT infrastructure can no longer just work; it must allow their business to respond at lightning speed. Infrastructure management provides the capabilities to help your client simplify and optimize his IT infrastructure to be able to do this. It tightens the link between the technologies that run your client's business and his business goals, allowing the IT infrastructure to help your client execute business strategies quickly and more efficiently.

Infrastructure management is the simplification and optimization of IT through automation and virtualization. It enables access to and creates a consolidated, logical view of resources across a network. Market research shows that your clients must have the following requirements to be able to remain competitive in today's dynamic, highly competitive environment:

- ▶ Increase flexibility to manage market volatility
- ▶ Optimize IT infrastructure
- ▶ Simplify and streamline business processes

Information management helps clients meet these requirements.

At the same time, an increasing number of industry regulations and compliance rules put more pressure on clients and challenge them with continuous changes to their environment. Competitive threats, financial pressures, and unpredictable conditions in the world require companies to manage additional complexity while ensuring the most productive utilization of their existing infrastructure. Clients are telling us that they struggle to bring more business discipline to their many billions of dollars invested in IT assets, much of which, they acknowledge to themselves, is inefficient and not accountable.

Given these pains, clients are asking themselves a series of questions:

- ▶ How do we best manage my complex, heterogeneous environment and reduce the associated management costs?

- ▶ Are there processes and best practices we can use to improve the way we construct and manage our IT environment?
- ▶ What will it take to improve the utilization of our existing resources?
- ▶ How do we reduce the operational costs of these systems?
- ▶ What can we do to make performance more predictable and automate many of the manual tasks that make operational changes so slow and labor so costly?
- ▶ How do we ensure current and future investments are not wasted?
- ▶ Is our IT infrastructure prepared to respond quickly to changes in business needs and priorities?
- ▶ How do we prioritize the management of my IT resources based on the business processes they support?

This leads to the following four major priorities:

1. Become agile.
2. Optimize IT resources.
3. Manage the complexity of the IT environment.
4. Reduce costs.

Infrastructure management encompasses a broad spectrum of capabilities. It ensures infrastructure reliability and availability to support business operations and allows companies to maximize the utilization of their existing IT infrastructure and reduce costs.

- ▶ **Availability:** Helps ensure the health and appropriate functioning of IT environments
- ▶ **Security:** Helps ensure that information assets, confidentiality, and data integrity are effectively protected
- ▶ **Optimization:** Improves IT assets utilization, helping to cut costs and optimizes an organization's overall IT productivity
- ▶ **Provisioning:** Makes the right resources available to the right processes and people
- ▶ **Infrastructure Orchestration:** Senses IT infrastructure conditions, anticipates trends, and dynamically responds based on business policy
- ▶ **Business Service Management:** Improves business agility by aligning IT with business priorities, and proactively managing service levels
- ▶ **Resource Virtualization:** Provides a single, consolidated, and logical view of and easy access to all available resources in a network (servers, storage, distributed systems/grid computing and the network)

IBM Infrastructure Management solutions help your clients to address their pain points. They allow them to work faster, handle bigger workloads and stay responsive to their business needs. Through the right combination of hardware, open-standards-based software, and industry-leading services, IBM solutions help your client to build an infrastructure that can support his business objectives around the clock, one that maximizes the use of a companies existing resources (hardware, software, applications, and people) while reducing costs.

Infrastructure management, therefore, is about enabling access to and creating a consolidated, logical view of resources across a network. To achieve this management of the client's infrastructure, we need to implement automation and virtualization capabilities.

7.2 Automation

This section introduces automation and describes the infrastructure management capabilities that support it. These capabilities are:

- ▶ Availability (business resilience)
- ▶ Security
- ▶ Optimization
- ▶ Provisioning
- ▶ Orchestration

Automation is the capability to dynamically deploy, monitor, manage, and protect an IT infrastructure to meet business needs with little or no human intervention. To help clients plan their own automation implementations, IBM has created an automation blueprint to assist clients in breaking down the tasks of implementing automation into specific capabilities that they can focus on as their business needs require.

Figure 7-2 shows the IBM Automation blueprint.

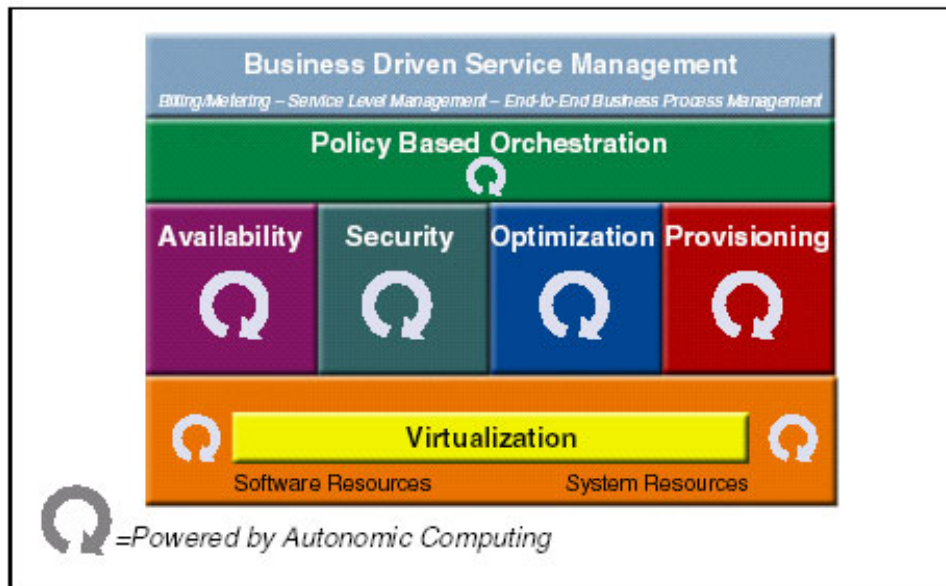


Figure 7-2 The IBM Automation blueprint

At the bottom of the blueprint is the foundation: the software and system resources with native automation capabilities required for higher-level automation functions. IBM has a full portfolio of hardware and software with built-in autonomic capabilities to allow for the most advanced levels of automation. Many of these resources can be virtualized to the other capabilities. The key point is that in order to achieve the highest levels of On Demand Business automation, resources need to be virtualized so that they can be dynamically provisioned as business policies require. Refer to 7.3, "Virtualization" on page 96 for more information about virtualizing resources.

The second layer from the bottom shows the key automation capabilities. Availability helps ensure that systems are available 24x7. Security keeps systems protected from threats and provides the functions for a great user experience in accessing applications and data they need while keeping out unwelcome users. Optimization provides tools to make the most of the resources that are in place so that they are running at peak performance and efficiency and provide the maximum return on investment. Provisioning focuses on the self-configuring,

dynamic allocation of individual elements of the IT infrastructure so that identities or storage or servers are provisioned as business needs dictate.

The next layer, policy based orchestration, helps clients automatically control all the capabilities of the four areas we just discussed so that the entire IT infrastructure is responding dynamically to changing conditions according to defined business policies. This orchestration builds on the best practices of the client's collective IT experience and helps to ensure that complex deployments are achieved with speed and quality.

Finally, business driven service management capabilities provide the tools needed to manage service levels, meter system usage and bill clients for that usage, as well as model, integrate, connect, monitor, and manage business processes end-to-end for complete linkage of IT and business processes. Refer to 5.3, "Life cycle of an On Demand Business service" on page 62 for more information about business driven services.

7.2.1 Availability (business resilience)

Availability (business resilience) means systems have to be available 24 hours a day, 7 days a week, 365 days a year to meet the requirements of global business. Automation can help you meet that requirement without employing huge amounts of human capital by monitoring your systems and automatically taking actions to maintain high availability without human intervention, and before issues become problems. To provide the kind of infrastructure that supports an On Demand Business requires a complex set of underlying technologies. However, to support a flexible and responsive business, the components must be able to be reconfigured, managed, and applied to the business objective. This task is immensely complex and cannot be accomplished without automation.

Availability helps to ensure the health and appropriate functioning of IT resources, such as servers, middleware, network devices, and applications.

Businesses are facing many issues as they transition from a traditional IT environment to an On Demand Business. The availability capability helps companies:

- ▶ Ensure infrastructure reliability and availability for business operations
- ▶ Anticipate and prevent, or diagnose and fix, infrastructure problems automatically
- ▶ Ensure continuity of business operations in the event of potential planned or unplanned disruptions
- ▶ Improve uptime and availability of systems, networks, and applications

The availability capability provides the following value to an operating environment:

- ▶ **Reliability and robustness:** Reliability and robustness are attributes of a system that can encounter a problem and stay running. A reliable and robust system can withstand problems that affect service levels, such as spikes in demand, hardware failures, and other environmental disasters.
- ▶ **Intelligence:** An intelligent system identifies outages quickly and handles bottlenecks automatically, correcting many component-level problems without disruption to service.
- ▶ **Maintainability:** Maintainable systems are those that need not be interrupted entirely in instances when hardware and software must be worked on.
- ▶ **Fault tolerance:** Fault-tolerant systems are able to run under even the most adverse circumstances. When a calamity occurs, fault-tolerant systems are automatically taken over by failover systems that ensure that a service is not interrupted.

7.2.2 Security

Security is the ability to ensure the business is protected from threats, which the right users get to the right information at the right time, and that the automation that helps these functions occurs without expensive help desk or administrator attention. As clients open their businesses up to potentially millions of users, it is critical that welcomed users are identified and provided with highly satisfying user experiences. It is equally critical that unwelcome users are also identified and prevented from accessing systems, causing damage, or even stealing other users' information. Security is certainly a key focal point of most clients today.

Security is the set of mechanisms, services, and management workflows designed to enforce business controls. Security also protects information assets, information flows, and the information technology environment in a manner consistent with the risk management objectives of the controlling organization.

The need for security management is driven primarily by the business need to effectively manage and protect information and access to that information. The security capability accomplishes this by:

- ▶ Protecting the privacy of client and employee information
- ▶ Securing the exchange of business critical information
- ▶ Managing the identities across enterprises
- ▶ Ensuring the integrity of the environment
- ▶ Managing the security policies to mitigate risks

Security ensures that information assets, confidentiality, and data integrity are protected. The security capability provides the following value to an operating environment:

- ▶ Policy-based security management: Provides the tools and techniques to define, provision, and manage the rules, data objects, decision criteria, and heuristics needed to react to dynamic operating conditions, security events, or changing business controls.
- ▶ Secure business transaction and collaboration: Provides an environment for clients, partners, and suppliers to integrate their business processes, and thus securely communicate and coordinate using security capabilities within hardware, operating systems, and middleware, leading to improved business performance and lower costs.
- ▶ Business controls and compliance: Provides input to policy and rule definition, providing guidance in terms of business and industry practices, legal and regulatory requirements, as well as the business and technical risk management posture. Compliance management measures the performance of the business system relative to the measures of effectiveness established by the business controls.
- ▶ Secure high-assurance systems and networks: Provide integrated security capabilities that increase the security of systems data, protecting them from viruses, hackers, and misuse by internal users. This includes network security capabilities, distributed security support, access control, auditing, authorization, tamper responding hardware encryption, and secure isolation through partitioning technology.
- ▶ Persistent information protection and privacy control: Provide the ability to safeguard client and employee information through policy-based access enforcement, data encryption and data and application isolation support provided in hardware, operating systems, and middleware. Additionally, persistent information protection and privacy control help reduce privacy compliance costs by automating manual procedures, builds trust by managing end-user consent to privacy policies, externalizes data-handling rules from applications and IT systems, and gets detailed reports on access to sensitive information to facilitate audit requirements.

Because security is such a critical topic for On Demand Business, it is further described in Chapter 10, "IBM techniques for On Demand Business" on page 147.

7.2.3 Optimization

Optimization helps clients make the best use of their existing resources and helps ensure all resources are running at peak performance and efficiency. It is critical to make the best use of the resources they already have, so we focus heavily on heterogeneous, cross-platform support that integrates with what is already installed. Tight IT budgets and the need to respond quickly drive clients to insist that their current investments are optimized. As with integration and virtualization, automation is not a new concept. But an On Demand Operating Environment requires new levels of automation that can provide the flexibility and responsiveness to support an On Demand Business.

Optimization is the process of improving IT resource utilization through enterprise storage and workload capacity management, and improving resource optimization by centralized control of workload scheduling.

The optimization capability helps businesses address:

- ▶ Excess and underutilized capacity
- ▶ Significant or redundant support staff costs
- ▶ Uncontrolled growth of servers and storage estate
- ▶ Complex mix of hardware and systems management platforms
- ▶ The interrelationships and dependencies of jobs requiring limited resources.

Optimization ensures the most productive utilization of IT infrastructure. Security ensures that information assets, confidentiality, and data integrity are protected. The optimization capability provides the following value to an operating environment:

- ▶ Optimal use of available resources: Optimization is of critical importance to IT professionals looking to ensure that they are getting the most from their existing resources and that the highest priority work takes precedence.
- ▶ Workload management: Workload between resources is automatically balanced for optimal throughput and performance.
- ▶ Proactive monitoring: Actions, implementation of storage resources, and business policies to prioritize workload are monitored to ensure that capacity is allocated appropriately.
- ▶ Centralized control: Increased resource utilization can be achieved by centralizing control of interoperating jobs and creating resilient workload management infrastructures that utilize emerging grid capabilities along with batch and scheduled tasks.
- ▶ Storage capacity management: Enterprise storage capacity management can optimize storage resources to make best use of storage investment using analysis, reporting, configuration, and monitoring, along with capacity trending and forecasting.

7.2.4 Provisioning

Provisioning is the end to end capability to automatically deploy and dynamically optimize resources in response to business objectives in heterogeneous environments. Provisioning helps to respond to changing business conditions by enabling the ability to dynamically allocate resources to the processes that most need them, driven by business policies. Provisioning of individual elements, such as identities, storage, servers, applications, operating systems, and middleware, is a critical step to being able to then orchestrate the entire environment to respond to business needs *on demand*.

Provisioning is the process of deploying, redeploying, and configuring resources in the IT environment in support of users, business processes, and applications.

The provisioning capability helps businesses address the following issues:

- ▶ Time required to repurpose resources in the IT environment
- ▶ Time-consuming patch management and distribution
- ▶ Complexity of IT environment, which makes configuration changes become more error prone because of complex dependencies
- ▶ Physically partitioning applications into independent environments, which results in low server utilization
- ▶ Need to consolidate applications and provision resources from virtualized resource pools
- ▶ Automation of end-to-end infrastructure changes not possible because of lack of integrated tools

The provisioning capability provides the following value to an operating environment:

- ▶ **Autonomic adaptation:** Autonomic adaptation provides an operating environment with the ability to adapt to changes in the infrastructure with minimal human intervention, based on goals and policies specified by the offering or provider administrator. This property must permeate the infrastructure from the highest level service down to the lowest level resource that supports that service.
- ▶ **Autonomic configuration management:** Keeping up with these regular changes becomes a challenge. Provisioning and autonomic configuration management tools can keep the data center running with minimal human interaction as the environment changes.

7.2.5 Orchestration

Orchestration provides the ability to act on events that occur within the data center. These events are usually acted on by the IT staff. Again, the IT staff can capture best practices into reusable elements that can be automatically initiated when certain conditions or service levels are threatened. Basically, an orchestration product (such as IBM Tivoli Intelligent ThinkDynamic Orchestrator) monitors the overall system and uses autonomic computing concepts to determine when an action needs to be taken. At a higher level, IBM Tivoli Intelligent ThinkDynamic Orchestrator (ITITO) lets administrator define service levels or service objectives and to specify at what threshold new resources should be provisioned. It also defines client tiers that allow decisions to be made based on the defined tier when there is resource contention.

Orchestration enables companies to manipulate their IT environments in real time, according to defined business policies, to achieve their desired business goals. Orchestrator senses an increase in the demand for resources and automatically takes action to reallocate resources accordingly by provisioning or reprovisioning resources throughout the entire system, including hardware, software, and applications.

The infrastructure orchestration capability helps businesses:

- ▶ Build a flexible IT infrastructure that can anticipate, forecast, and respond quickly to changing business goals, marketplace changes, and client demands
- ▶ Insulate applications from computing resources
- ▶ Consolidate and integrate computing resources
- ▶ Maximize utilization of computing resources

The infrastructure orchestration capability provides the value to an operating environment by doing the following:

- ▶ Directing IT resources where business needs are most critical
- ▶ Proactively sensing and responding to peaks in demand
- ▶ Allocating resources based on business policies
- ▶ Moving from just-in-case provisioning to just-in-time provisioning, to ensure that there are enough resources to meet peak demand
- ▶ Automating IT infrastructure and executing changes as needs arise
- ▶ Sensing changes in demand for resources and automatically triggering action to reallocate resources throughout an entire system, including hardware, applications, and information
- ▶ Increase organizational productivity by automating the allocation of IT resources, without disrupting the way that the business currently operates

Policy based orchestration

Policy based orchestration is all about providing an end-to-end IT service that is dynamically linked to business policies, allowing the ability to adapt to changing business conditions. Having each individual element of an IT system respond to change is definitely a great start, but in the end, to truly be an On Demand Business requires orchestration of the automation of multiple elements of the systems so that the entire IT infrastructure is responding as it should to changes in business policies or conditions. For example, if a client's order entry application suddenly experiences a surge in load, just allocating more CPU may not be enough; it may also need additional storage, more networks capacity, and even additional servers and new users to handle the increased activity. All of these changes must be orchestrated so that the dynamic allocation of multiple resource elements occurs seamlessly.

Provisioning orchestration

Provisioning and orchestration allow for automatic management of IT resources. Resources can be storage space, a new server, network bandwidth, software, or virtually any of the components of a data center. Currently, to add resources, an IT person must manually take physical action. Automated provisioning lets the IT staff store their knowledge into a reusable element. Tasks such as installing an operating system, adding a new server, installing a software patch, enabling a network port, and so on, can then be automated.

With an automated provisioning tool (such as IBM Tivoli Provisioning Manager), an administrator can automate this process by coalescing his or her knowledge into a well-defined, repeatable set of actions that the software can take when needed.

In an ODOE, it becomes necessary to provision resources, which are composed of other resources. When provisioning these “composed” resources, it becomes necessary to interact with the resource managers of each of the components of the composed resource to make the top-level resource available for use.

For example, if there is a request to provision a new service, IBM first must understand the components of the service, its prerequisites and dependencies on other services, and the current available resources in the environment. IBM would then sequence the actions necessary to install new resources (or reconfigure current resources) to support this new service. For composed resources, this process would need to be applied to the resources that fall under the top-level resource until IBM reaches the “elemental” resources at the bottom of the chain. This process is called provisioning orchestration, and can take place at each level of a composed resource hierarchy. Figure 7-3 on page 94 provides a high-level illustration of this concept (depicting both composed resources and composed resource managers).

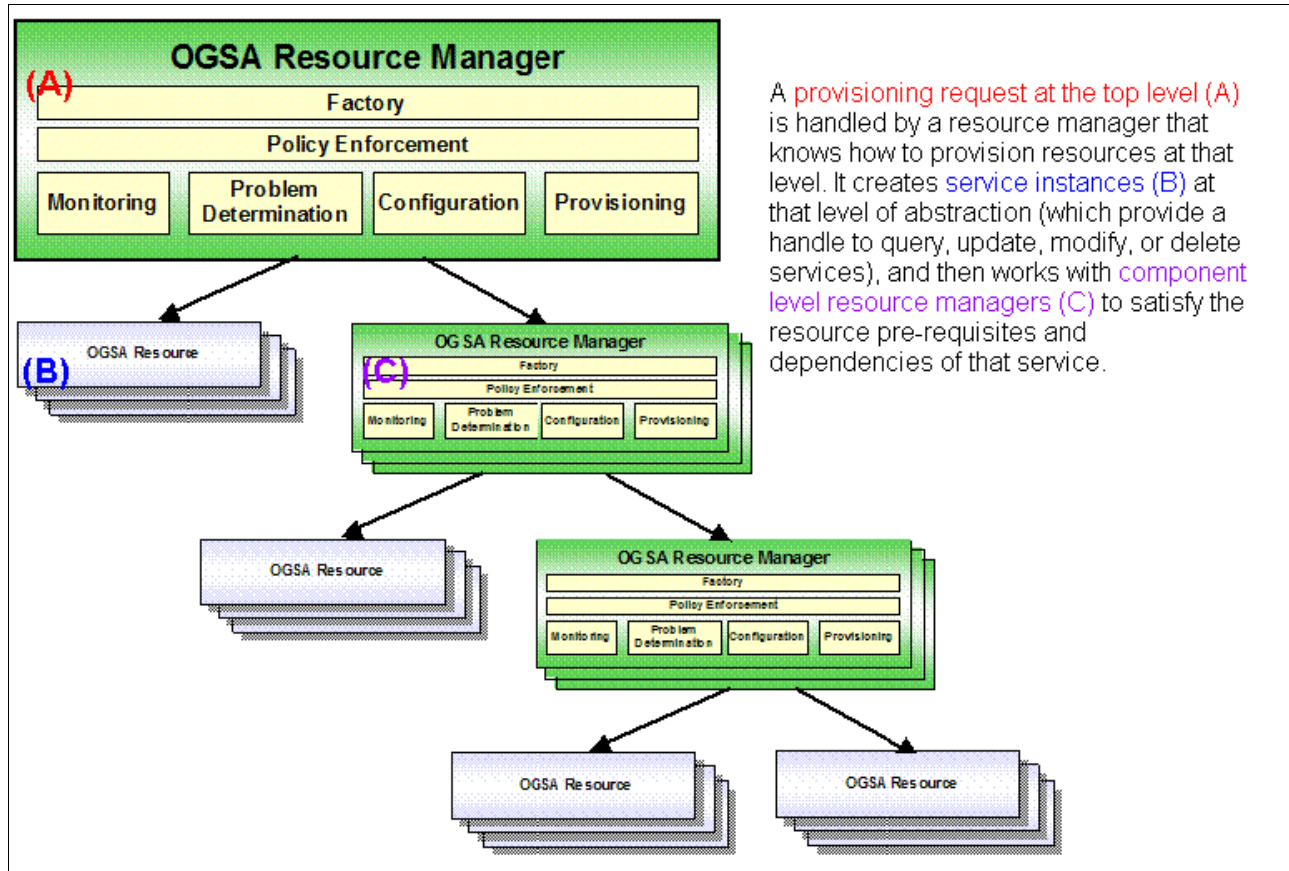


Figure 7-3 The concept of provisioning orchestration

Note regarding provisioning and orchestration

Operating environments in large data centers have become increasingly complex. The centers usually require a long time to modify their environments, so most provision for the worst-case scenario. They provision more hardware than is needed just in case a peak is experienced. This results in inefficiencies because most hardware and other resources are underused. High capital and running costs also occur. And, there is still an unresolved issue of surges beyond what has been provisioned.

For example, in Figure 7-4 on page 95, there are three separately provisioned environments, two of which are experiencing low utilization and have excess capacity, and a third environment that is experiencing high utilization at a certain point in time. As the times change, the utilization might change depending on the workload, but because there is a defined set of resources, the capacity is static and capped.



Figure 7-4 Independent provisioning

As shown in Figure 7-5, resource pooling will allow quick and efficient addition of resources when and where they are needed. The goal is to simplify, and provisioning and orchestration are the key to that vision.

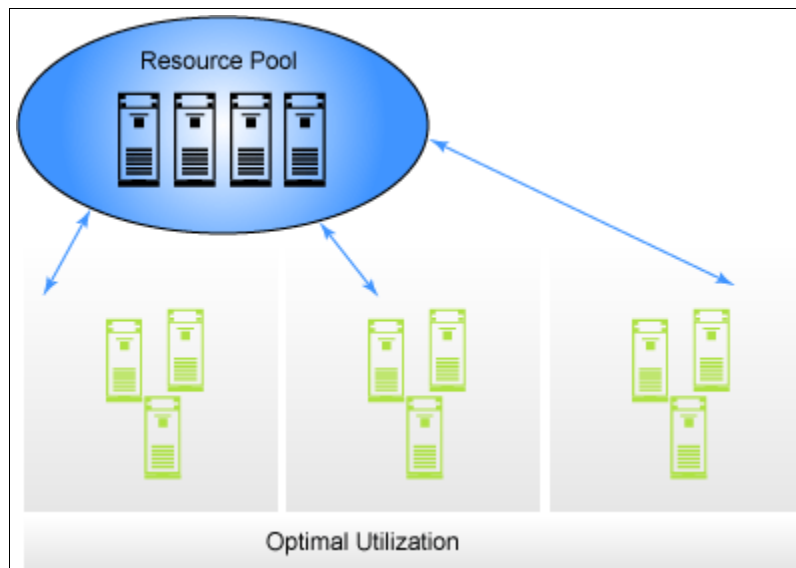


Figure 7-5 Pooling resources for efficiency

A fully autonomic computing system will be able to predict when new capacities need to be provisioned (or de-allocated) and would do so automatically.

Right now, in order to add capacity using machines that are already in place, an administrator needs to determine the actions to take, and then physically perform an act, such as mapping a new drive, or worse, physically manipulating hardware. Some situations might even require moving servers from one place to another. Even less physically demanding tasks such as installing operating systems and software are rife with opportunity for human error as systems become more complex.

7.2.6 Business service management

Business service management helps clients reduce costs and increase responsiveness by aligning their IT organization with their business priorities.

Business service management:

- ▶ Provides the critical linkage that allows the business to drive IT decisions and priorities
- ▶ Communicates the business value of IT and meets business objectives by linking these objectives with IT management and transforming IT data into business information
- ▶ Consists of intelligent, policy-based solutions to build, run, and manage critical dynamic business processes through automation, integration, and predefined best practices
- ▶ Responds dynamically based upon real-time business service information and historical trending analysis while prioritizing resources intelligently

The following IBM products support business service management:

- ▶ IBM Tivoli Business Systems Manager
- ▶ IBM Tivoli Service Level Advisor
- ▶ IBM WebSphere Business Integration Family
- ▶ IBM Tivoli License Manager
- ▶ IBM Tivoli Monitoring for Transaction Performance

7.3 Virtualization

This section describes the Infrastructure management capabilities that support virtualization. The capabilities are:

- ▶ Resource virtualization
- ▶ Grid computing
- ▶ Utility computing

7.3.1 Resource virtualization

Most applications typically have not been designed to be integrated with other applications or software. Internal applications are generally developed to support one specific business area or function, and each application usually runs on its own dedicated physical server or set of physical servers and has its own physical storage devices. There is very little, if any, sharing of IT resources between different applications unless they were deployed on mainframe-based machines or on machines that supported partitioning. This has led to the fragmented, heterogeneous infrastructures that exist today and often creates a lack of flexibility within an organization's IT environment.

In an On Demand Operating Environment, virtualization is needed to uncouple the applications from the physical configurations. Recall that virtualized is one of the four essential characteristics of an ODOE, and that resource virtualization is one of its infrastructure management capabilities.

Resource virtualization provides the ability to aggregate pools of resources into a logical view that enables and delivers increased utilization of resources, simplified management, and improved availability of resources while extending access to the application. These resources can be servers, storage, networks, applications, and distributed systems.

The resource virtualization capability helps businesses:

- ▶ Ensure high infrastructure reliability and availability
- ▶ Maximize utilization of existing computing resources
- ▶ Consolidate computing resources to reduce complexity
- ▶ Simplify infrastructure monitoring and management
- ▶ Automatically deploy and optimize IT resources

The resource virtualization capability provides the following to an operating environment:

- ▶ Simplification and optimization of IT infrastructure: Resource virtualization simplifies an infrastructure by aggregating pools of resources, enabling access to a consolidated, logical view throughout a distributed environment. It reduces cost and complexity through optimized resource utilization, and increases the business value of IT investments using innovative solutions that leverage IBM's virtualization heritage.
- ▶ Achievement of On Demand Business breakthroughs: Resource virtualization enables flexibility and innovation using open technologies, and provides a dynamic virtualization fabric with a set of management services to deliver On Demand Business access to resources within a system or across multiple systems in an enterprise. Advanced virtualization technologies and management services increase the agility of the infrastructure, allowing stronger integration of IT and business goals.

Forms of virtualization

The three forms of virtualization are:

1. Binding and location transparency
2. Logical projection
3. Adaptation.

They are described as follows:

1. Binding and location transparency: A key characteristic of the On Demand Business infrastructure is its ability to manage the resources of the system in a dynamic way, often while those resources are assigned and in use. For example, to enforce a performance or availability related service level goal, it might be necessary to move and rehost a resource in a different location while it is assigned and bound to one or more applications using it. Figure 7-6 on page 98 is an example of binding and local transparency in which an application has been assigned more resources than it needs and releases the resource for redeployment. (An application no longer requires as much capacity as it needed previously. Virtualization allows to remove the resource that is no longer needed. An end user requests that a request be removed. A UMI coordinator queues the request and uses available ODOE Infrastructure Management tools to remove the resource and return it to the cluster free pool. The system configuration is then updated.)

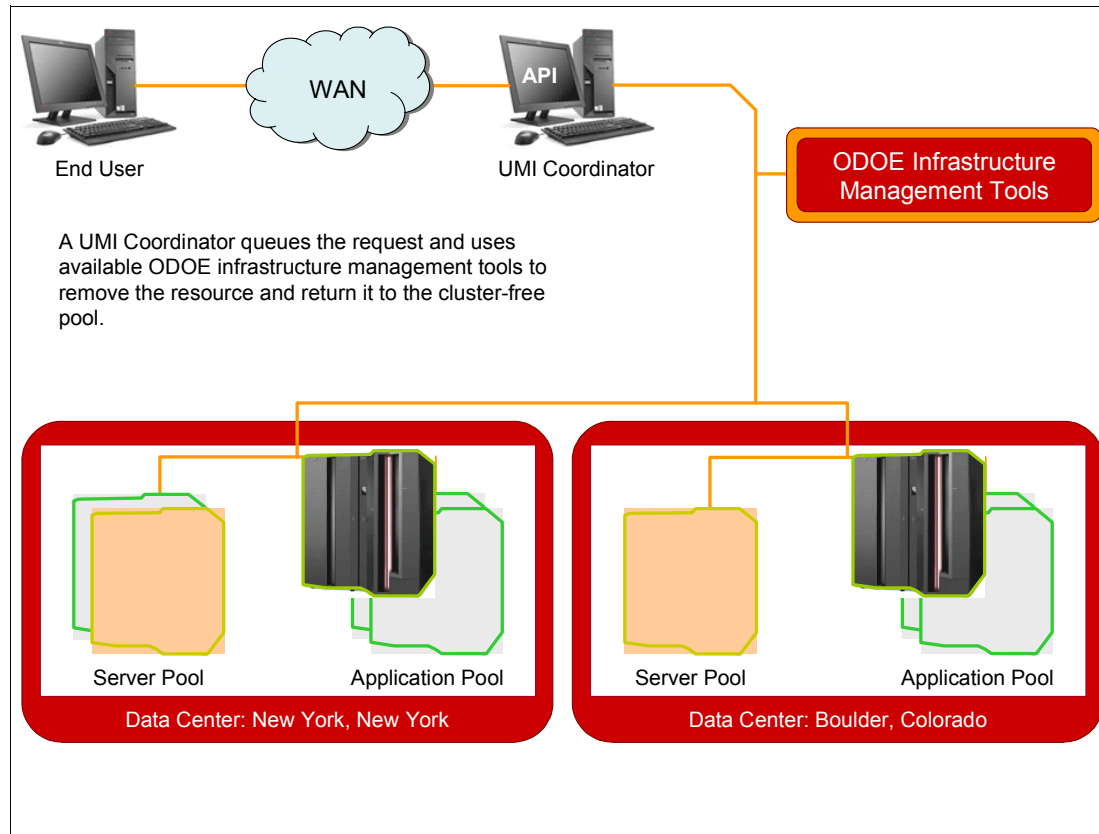


Figure 7-6 An example of binding and local transparency

Figure 7-7 on page 99 is an example of binding and local transparency in which a component is under-resourced and is provided the needed backup. A system experiences an unexpected increase in users of an application. Virtualization allows you to submit a request to deploy an application. A UMI coordinator queues your request and uses available ODOE infrastructure management tools to provision the application, which is deployed. The system processes updates for software license and inventory components.

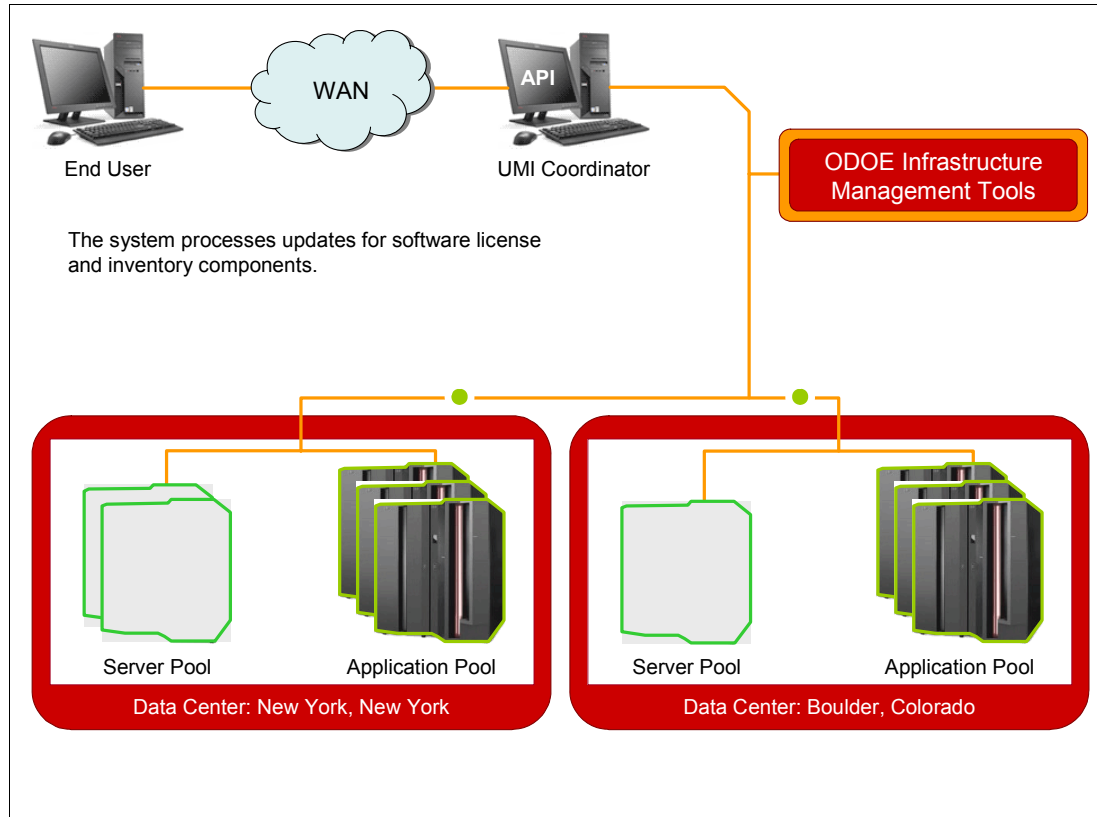


Figure 7-7 An example of binding and local transparency in which a component is under-resourced and is provided the needed backup

2. Logical projection: Possibly the most used and best understood example of virtualization is the ability to present the illusion of more resources than actually exist. This type of virtualization is an extension of the location and binding transparency described previously. A practical application of this type of virtualization in the On Demand Business infrastructure is its ability to provide large amounts of logical processing capacity over a limited set of physical resources in the configuration. As the capacity requirement of a given application instance increases, the On Demand Business infrastructure can make informed tradeoffs in the physical resource allocation to allow more of the physical resources to be assigned to the logical resources used by the application in need of more capacity. Figure 7-8 on page 100 is an example of logical projection in which a component is under duress and another is accessed to supply the needed capacity. A probe continuously monitors the system and instantly detect problems. When a problem arises, it alerts the ODOE Infrastructure management tools that are in place and logs a request for help, for example, an application pool might require more resources to run properly. The UMI coordinator uses one of the ODOE Infrastructure Management tools to move needed resources into the cluster-free pool and then to the over-taxed application pool. Any servers not needed for the application remain in the server pool. System configuration information is updated and all applications continue to run with out interruption.

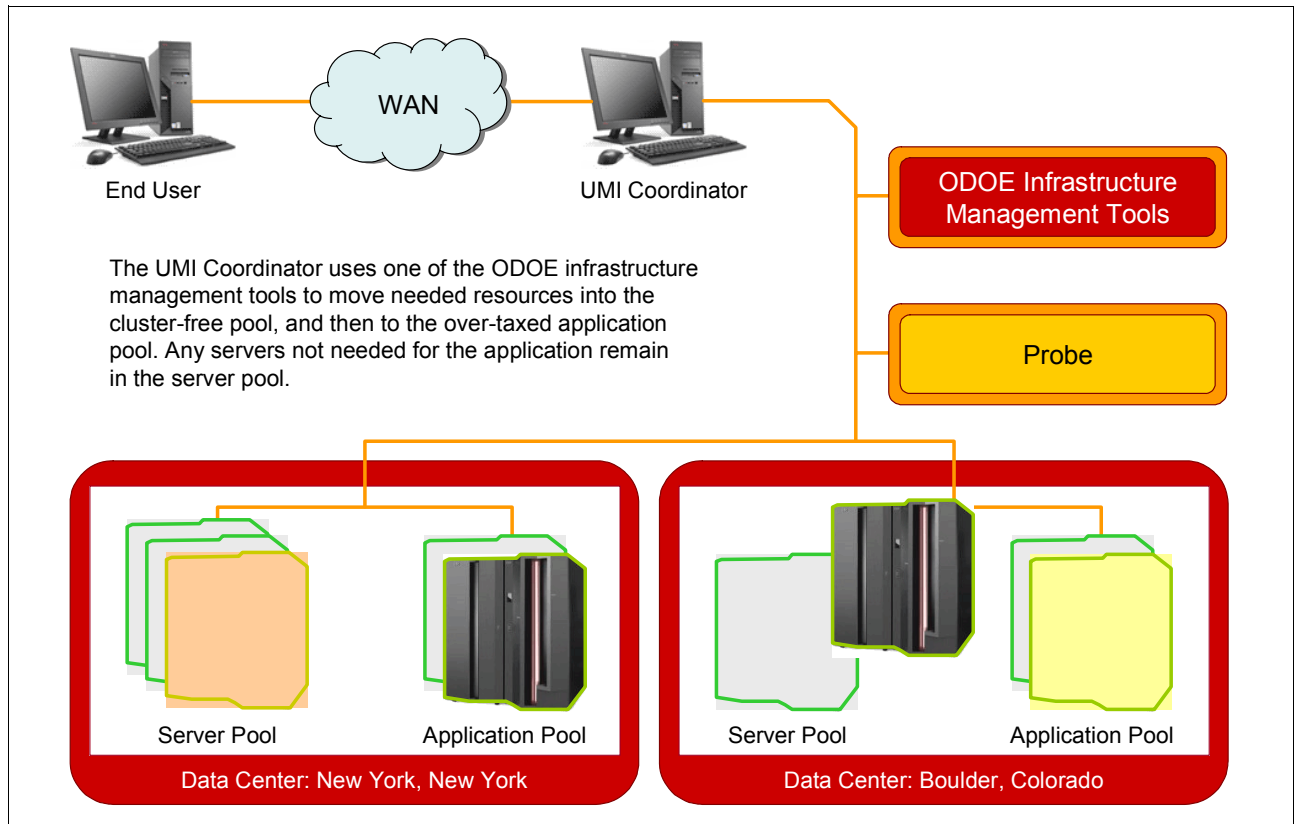


Figure 7-8 Example of logical projection in which a component is under duress and another is accessed to supply the needed capacity

Figure 7-9 on page 101 is an example of logical projection in which a component fails and another is used to support the infrastructure. An application begins to fail due to hardware problems. While constantly monitoring the network, the probe instantly detects a problem and alerts the ODOE Infrastructure management tools, which automatically note the problem and make an update. Using one of the ODOE Infrastructure management tools, the UMI coordinator find that cluster-free pool does not have enough replacement resources. Based on defined service levels, the UMI coordinator removes resources from another application and returns them to the cluster-free pool. The UMI coordinator then moves these resources to the failing application cluster. The configuration information is automatically updated, and the application is running again.

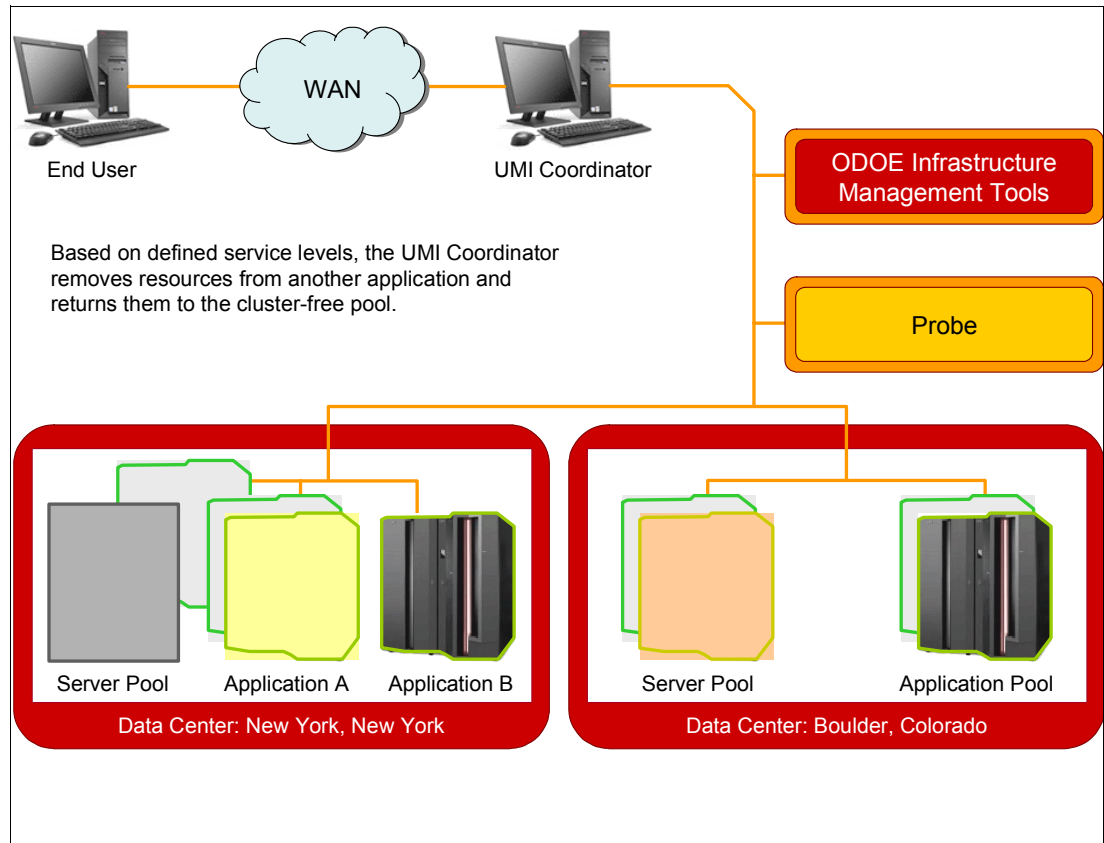


Figure 7-9 Example of logical projection in which a component fails and another is used to support the infrastructure

3. Adaptation: In the simplest terms, adapters provide an interface to an application or service. That service may be an infrastructure service or an application. Existing applications are adapted to service declarations. There is an adapter, for example, following the WebSphere Business Integrator model. The adapter implements the service interface and transforms messages to operate on the existing application, as shown in Figure 7-10 on page 102.

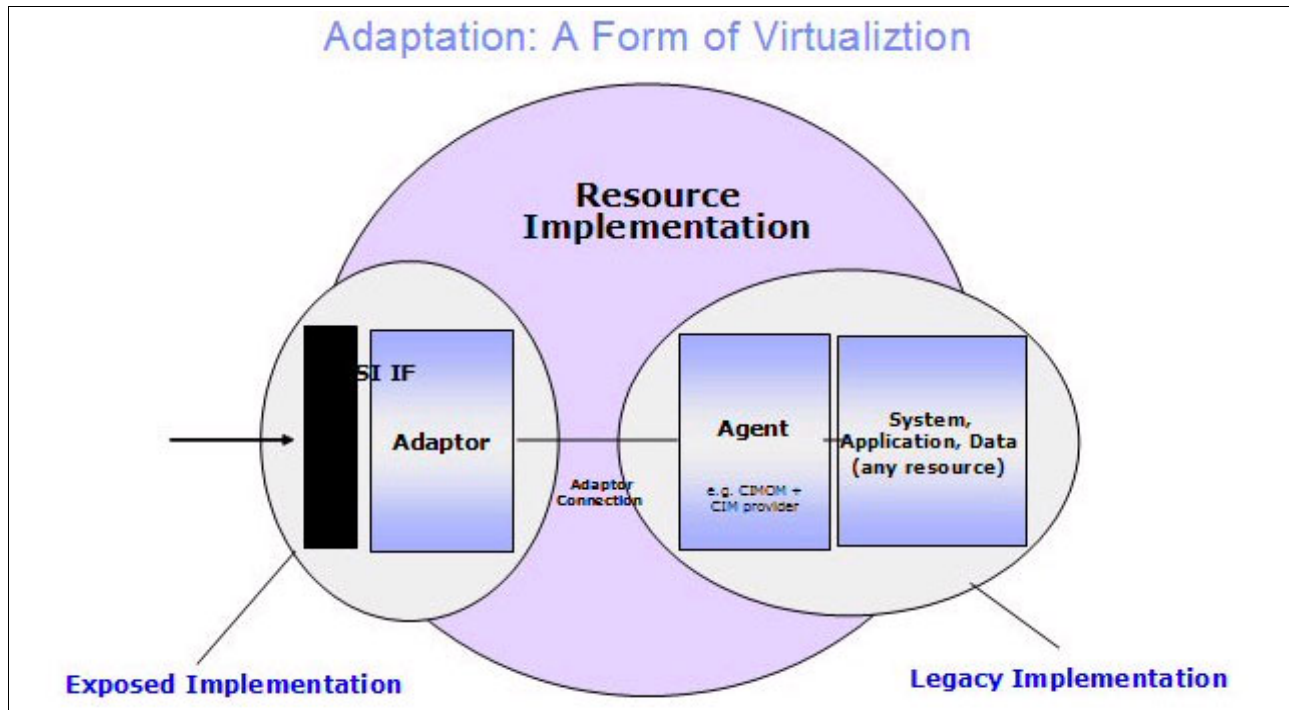


Figure 7-10 Adaption: a form of virtualization

One of the architectural requirements imposed upon the On Demand Business infrastructure is the need to leverage existing legacy implementations in the construction of more uniform and standardized resources to provide more coherent resource management and increased integration across the system. Existing resource implementations must be extended and adapted to allow the integration with the On Demand Business management infrastructure. It is important to point out that there is no architectural requirement to host the implementation of the adapter on the same server with the agent or legacy resource implementation. As long as the connection between the adapter and the legacy implementation can be made, the path to the underlying legacy implementation can be physically distributed across the network. In fact, for practical reasons, it can be desirable to deploy the adapter in a Web services-based application server, which could require processor and memory resources that cannot be made available in the environment hosting the actual underlying resource implementation.

Virtualization and workload management

IBM has been delivering systems that have provided virtualization for many years. Workloads running on mainframes today exploit technologies, such as virtual memory, where each application thinks they have their own real, dedicated memory. Logical Partitioning (LPAR) enables clients to slice a machine into virtual partitions and provides the flexibility to dynamically change the allocation of system resources for those environments.

Virtualization is now expanded beyond the scope of one physical box and one architecture to deliver the classical benefits of virtualization on an end-to-end scale, across all architecture, including servers, storage, and networks. This new level of virtualization is complemented by technologies that realize the capabilities of provisioning and workload management.

There are a number of different dimensions of workload management: Workload balancing is one dimension; scheduling is another dimension. These dimensions often coexist in a single application or service environment. Workload management provides the control to ensure that system resources are provided to the applications that are most critical to the business. Workload balancing can be thought about as the ability to move work to available capacity

and making adjustments in the priorities of different classes of work. Often, workload balancing implies the need to make trade-offs in the allocation of resources to best meet the needs of the most important work in the system. For data, you might move work to the data, or move the data to the work. Scheduling can be viewed as those management decisions related to the timing of the allocation of resources to meet a workload management goal.

The virtualization capability is integrated into the base hardware and microcode of the physical server, and it allows for a definition of virtual servers with a subengine granularity. For example, by utilizing common hardware and microcode components, both the IBM @server i5 and p5 systems offer Micro-Partitioning™, where the POWER5™ processors on the servers can be allocated to tenths of a processor among the partitions. In addition, both the iSeries and pSeries® enable you to run multiple operating systems in different partitions, and allow processors, memory, and I/O to be shifted among active partitions without requiring the operating system to be rebooted.

In addition to the flexibility provided by this level of isolation, certain models of the IBM @server are certified to meet the Common Criteria at Evaluation Assurance Level 4+ (EAL4+), which demonstrates the reliability, workload isolation, and security that can be achieved through virtualization.

The IBM @server pSeries is not alone in delivering this kind of virtualization. The IBM @server zSeries mainframe has a similar level of function and continues to build on it by adding ever-higher numbers of LPARs and virtual I/O capabilities, while retaining its famed isolation and security.

In IBM @server Logical Partitioning, there is no affinity between the processor engine resources, the memory, and the I/O interfaces, thereby making it possible to provision. IT organizations that exploit these technologies derive value and benefits in the form of easier management and cost savings from sharing system resources, which in turn results in more efficient use of those resources. Businesses can take action today to become on demand business by exploiting these same types of technologies as they continue to evolve into other IBM @server platforms. For example, companies can exploit LPAR technology on the zSeries, pSeries, and iSeries platforms today. System resources including processors, memory, disks, system buses, and I/O can be associated with a given partition. Processors can be in a “shared pool” and moved among partitions on an as-needed basis. In addition, solutions such as VMware, which provides virtualization capabilities on the xSeries platform, can be used to increase the utilization of those Intel®-based machines.

The most advanced software virtualization product on the market is the IBM z/VM® product running on the IBM mainframe. z/VM takes advantage of the hardware capabilities within the mainframe hardware and establishes a very low overhead and highly secure virtualization platform. It enables the consolidation of large numbers of servers in a virtual server farm. z/VM is also the main virtualization enabler for Linux on the mainframe.

Another virtualization capability, Capacity on Demand, is implemented across the IBM @server platforms. zSeries, iSeries, and pSeries servers provide support for temporary or permanent processor enablement based on a client need.

Virtualization capabilities are also available through the use of IBM @server BladeCenter® technology. The IBM @server BladeCenter can be used to increase the cost efficiency of these Intel-based servers by providing the capability to share system resources, such as Ethernet adapters and fiber optic switches across all blades within the BladeCenter. The BladeCenter offers the capability to scale out. A BladeCenter can be configured without all blade slots being fully populated. As additional capacity is needed, more blades can be added to populate the BladeCenter. This variable cost model allows the unit to be partially populated

with blades, thereby reducing the number of blades that may sit idle in the BladeCenter until some future point when the business need drives applications.

7.3.2 Grid computing and On Demand Business

Grid computing is fundamental to On Demand Business, particularly in the area of virtualization. In an On Demand Business environment, software applications must be:

- ▶ Integrated: Grid computing is made possible with technologies that integrate systems by enabling communications between applications.
- ▶ Open: Open standards are necessary to grid computing. The only way to enable communication among applications and systems, and make grid computing possible, is with open industry standards.
- ▶ Virtualized: Grid computing virtualizes hardware resources, data, and applications. With grid computing, the end user experiences a single view of and easy access to all of the resources available. The user does not need to consider what resources are needed by the application, what computers it runs on, or where the data resides. This virtualization of resources is at the heart of grid computing.
- ▶ Automated: Grid computing is a major step towards automated systems. The demands of a grid in terms of reliability and scalability are driving the development of the technologies needed for self-healing, self-configuring, self-protecting, and self-optimizing systems.

With grid computing, organizations can connect and use a variety of computer and data resources, regardless of operating systems and platforms, as if it was one system. This virtualization allows organizations to:

- ▶ Use otherwise idle computer resources to accelerate business processes
- ▶ Accelerate applications so that processes that used to take hours can now take minutes, driving faster time to market
- ▶ Enable the development of new and more productive applications
- ▶ Increase collaboration and productivity
- ▶ Greatly increase the resources available to their employees
- ▶ Increase the resiliency and utilization of their IT environment

As indicated in Figure 7-11 on page 105, the value of an On Demand Business environment is driving grid computing into the enterprise.

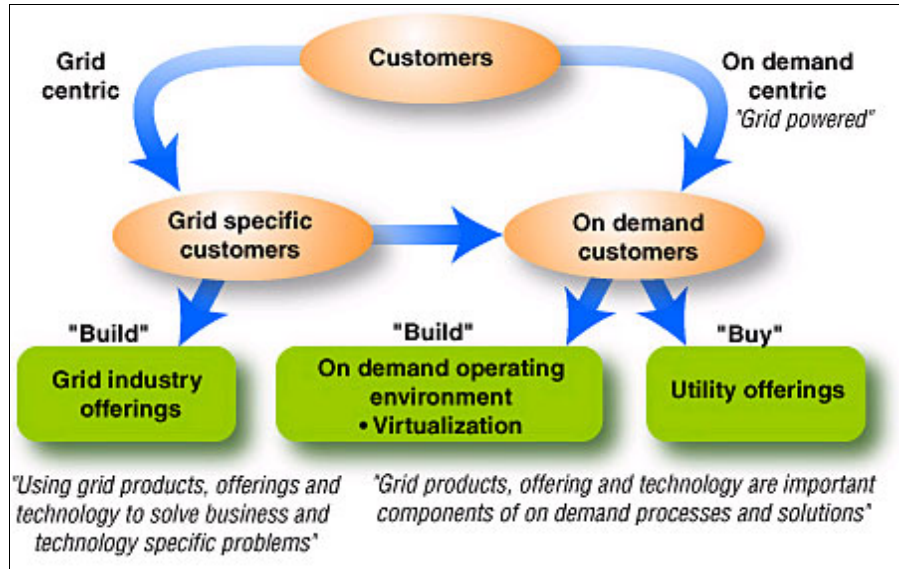


Figure 7-11 Driving grid computing into the enterprise

Grid computing enables the virtualization of distributed computing and data resources, such as processing, network bandwidth, and storage capacity to create a single system image. Grid computing grants users and applications seamless access to vast IT capabilities. Just as an Internet user views a unified instance of content via the Web, a grid user essentially sees a single, large virtual computer.

At its core, grid computing is based on an open set of standards and protocols that enable communication across heterogeneous, geographically dispersed environments. With grid computing, organizations can optimize computing and data resources, pool them for large capacity workloads, share them across networks, and enable collaboration.

In fact, grid can be seen as the latest and most complete evolution of more familiar developments, such as distributed computing, the Web, peer-to-peer computing, and virtualization technologies. Table 7-1 shows a comparison between these developments and grid computing.

Table 7-1 Developments and grid computing

Development	Grid computing
Web	
Like the Web	Grid computing keeps complexity hidden: multiple users enjoy a single, unified experience.
Unlike the Web, which mainly enables communication	Grid computing enables full collaboration toward common business goals.
Peer-to-Peer	
Like Peer-to-Peer	Grid computing allows users to share files.
Unlike Peer-to-Peer	Grid computing allows many-to-many sharing - not only files but other resources as well.
Clusters and Distributed Computing	
Like Clusters and Distributed Computing	Grids bring computing resources together.

Development	Grid computing
Unlike Clusters and Distributed Computing, which need physical proximity and operating homogeneity	Grids can be geographically distributed and heterogeneous.
Virtualization technologies	
Like Virtualization technologies	Grid Computing enables the virtualization of IT resources.
Unlike Virtualization technologies, which virtualize a single system	Grid Computing enables the virtualization of vast and disparate IT resources.

Because grid computing dovetails naturally with powerful developments in IBM like autonomic computing and On Demand Business, grid offers businesses a host of practical benefits for coping with, and taking advantage of, an on demand world. The following are samples with grid computing technology benefits:

- ▶ Infrastructure optimization:
 - Consolidate workload management
 - Provide capacity for high-demand applications
 - Reduce cycle times
- ▶ Increase access to data and collaboration:
 - Federate data and distribute it globally
 - Support large, multi-disciplinary collaborations
 - Enable collaboration across organizations and among businesses
- ▶ Resilient, highly available infrastructure:
 - Balance workloads
 - Foster business community
 - Enable recovery and failure

Based on differing levels of complexity, grids for the enterprise can be categorized as one of the following types:

- ▶ Infra-grid: This grid architecture enables optimizing resource sharing within departments in one division of an organization. This is a very controlled environment with well-defined business policies, integration, and security requirements. Because the management issues are contained within a single management domain, the focus can be kept primarily on gaining technical experience. These types of grids are sometimes called “cluster grids.”
- ▶ Intra-grid: This more complex grid implementation is a scenario for resource integration by using the computing and data/storage resources of various divisions within an organization. These types of grids need well-defined policies for the sharing of resources within the enterprise, and valuable experience can be gained in dealing with the more complex security, data sharing, and resource sharing policies required. However, because the resources are within the same enterprise, the primary focus can still be on the technical implementation of the policies defined. These types of grids are sometimes called “enterprise grids” or “campus grids.”
- ▶ Extra-grid: These grids deal with sharing of resources, including those belonging to a trusted external partner with whom a business relationship has already been established. These types of grids are also known as “partner grids.” Because these grids extend outside the management domain of a single enterprise, mutual or shared partner agreements and service-level objectives on resource utilization are required. Establishing

these agreements provides valuable experience in writing, maintaining, and managing access according to grid service-level agreements.

- ▶ **Inter-grid:** An inter-grid enables the sharing of computing and data/storage resources across a public Web in collaboration with other enterprises, potentially selling excess capacity, for example. This is more of an on-demand utility conception of a grid, with inherent complexities in managing service-level requirements, security federation, and integration. Its requirements will, in part, build upon the experiences and critical skills gained from the previous grid implementation types.

Some styles of grids include:

- ▶ **Computational grids:** Dedicate at least some of the resources of multiple computers to handle data-crunching or other demanding workloads, on the fly. Includes scavenging grids, which use otherwise idle computers for tasks not efficiently handled by a single computer.
- ▶ **Hybrid grids:** Blend characteristics of computational grids with characteristics of information grids.
- ▶ **Information grids:** Provide an integrated interface to work with and manage data stored in multiple repositories.

Key grid computing concepts

The purpose of a grid is to virtualize resources to solve specific problems. Those resources can include, but are not limited to:

- ▶ **Computing or processing power:** Probably the most-commonly used resource on any grid is the processing power of the computers involved. This power can be used in various ways, depending on the needs of the applications and organizations involved.
- ▶ **Storage:** Most computers on a grid are likely to contribute some storage space to the grid for data, even if this is mostly temporary files. On an information grid, entire databases can be distributed across multiple machines. Managing the storage of the grid is often handled by special networked file systems. If necessary, files can span several computers, while appearing to the user as one large, virtual system.
- ▶ **Communications:** Within the grid, communications between the participating computers is obviously essential. Special attention must be paid to the bandwidth required for this communication, because applications that handle large amounts of data may need more bandwidth among computers. Communications from the grid to other networks and the Internet can be important, too.
- ▶ **Software:** The software installed on any of the computers participating in the grid can be a resource for the grid. Part of managing a grid includes knowing what software is available to the grid. When a task requires specific software that may only be found on certain computers, the grid can direct that task to those computers.

Table 7-12 on page 108 shows the basic components of a grid.

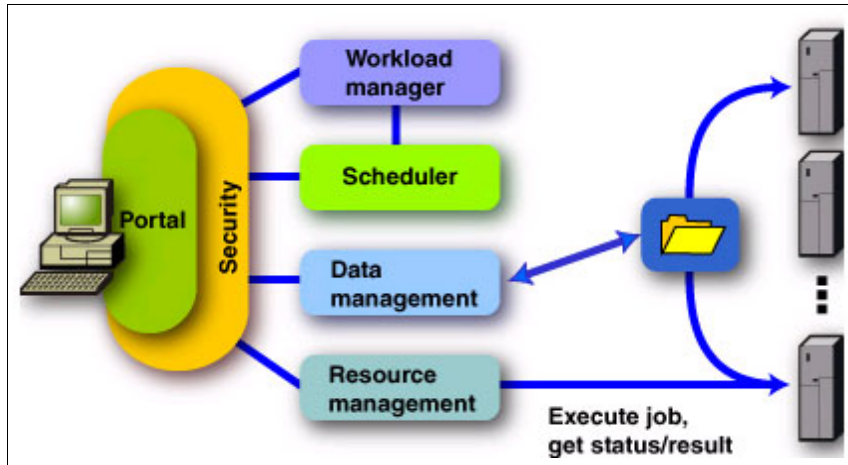


Figure 7-12 The basic components of a grid

Although other components may be needed depending on the nature of the grid and the work to be done, the basic facilities common to most grids include:

- ▶ **Security:** In today's environment, security is a necessity, not a luxury. The computers on a grid are networked and running applications, and they could be handling sensitive or extremely valuable data. Therefore, the grid must be secure. This includes elements such as encryption, authentication, and authorization.
- ▶ **User interface:** In many cases, the user interface simply is whatever is provided by the application that a user employs. The application does all of the work of contacting and using the grid. In other cases, users might need a way to access the grid, in which case, the user interface is often referred to as a *portal*. Like a Web portal that provides a range of information in one place, the portal allows the user to access the applications and resources available on the grid.
- ▶ **Workload manager:** Any application that a user wants to run on a grid must know what resources are available. This can be accomplished through a *workload manager service*. The application can communicate with the workload manager to discover what resources are available and what their current status is.
- ▶ **Scheduler:** A scheduler is used to locate the computers on which to run an application and assign the jobs required. Although this could be as simple as taking the next available resource, often it is a complex task involving prioritized job queues, load management, and progress monitoring. In addition, resources can be reserved for specific tasks and the scheduler must be able to respond appropriately.
- ▶ **Data management:** When an application runs on a computer that does not contain the data needed, the data management facility handles the job of moving that data. This can involve multiple machines and protocols. As with the grid as a whole, the data management facility must be secure and reliable.
- ▶ **Resource management:** The resource management facility performs the core tasks of launching jobs on specific resources, monitoring the status, and retrieving results.

Fundamental technologies for grids

Grid computing is an improved infrastructure for delivering services. Services are central to grid computing. Those services can include data queries, data management, processor requests, workload balancing, job scheduling, and bandwidth allocation.

In a grid, the services that are delivered are called *grid services*. Grid services are the heart of the grid. Some computers host grid services, whereas other computers run applications

that contact grid services as clients. *Grid services are essentially Web services with additional functionality.*

Web services allow applications to communicate with each other, regardless of platform or programming language. A Web service is a group of application functions that can be invoked over a network. Web services use Simple Object Access Protocol (SOAP) for messaging. Web Services Description Language (WSDL) is used to describe the application functions contained in a Web service and how they can be invoked. Universal Description, Discovery, and Integration (UDDI) registries are lists of available Web services, with their Uniform Resource Identifiers (URI).

Figure 7-13 shows how Web services work:

1. Applications locate available Web services by first querying a UDDI registry.
2. The UDDI registry returns the URI of the Web service.
3. Applications use the URI to contact the Web service to retrieve the WSDL document.
4. The Web service returns a WSDL description.
5. Applications, knowing what services are available and how to invoke them, send SOAP messages to the Web service to invoke specific functions.

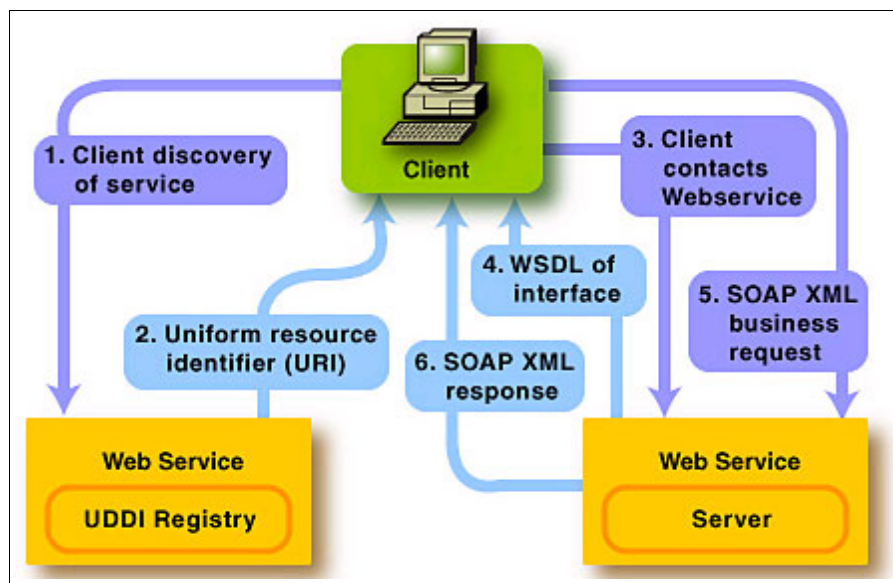


Figure 7-13 How Web services work

Notice that all of this is going on between applications and Web services. Users do not interact with Web services directly. Grid services enhance Web services primarily by adding *state* and *transience* (or life cycle management). Life cycle management is made possible by using a factory.

State

A Web service does not retain data from one invocation to the next. A grid service can, and thus it has state.

Transience or life cycle management

Only one copy of a Web service exists and all of the applications that contact it share it. By contrast, there can be as many instances of a grid service as needed, and each is independent. Typically, there would be one instance for each application, but it is possible for

one instance to be shared by multiple applications, if needed. Unlike Web services, instances of grid services are temporary. Each instance can be destroyed when it is no longer needed.

Factory

Instead of having one and only one grid service that is shared by multiple applications, a main grid service factory creates and destroys grid service instances as needed. As illustrated in Figure 7-14, the service factory creates service instances as requested by various clients and each is independent.

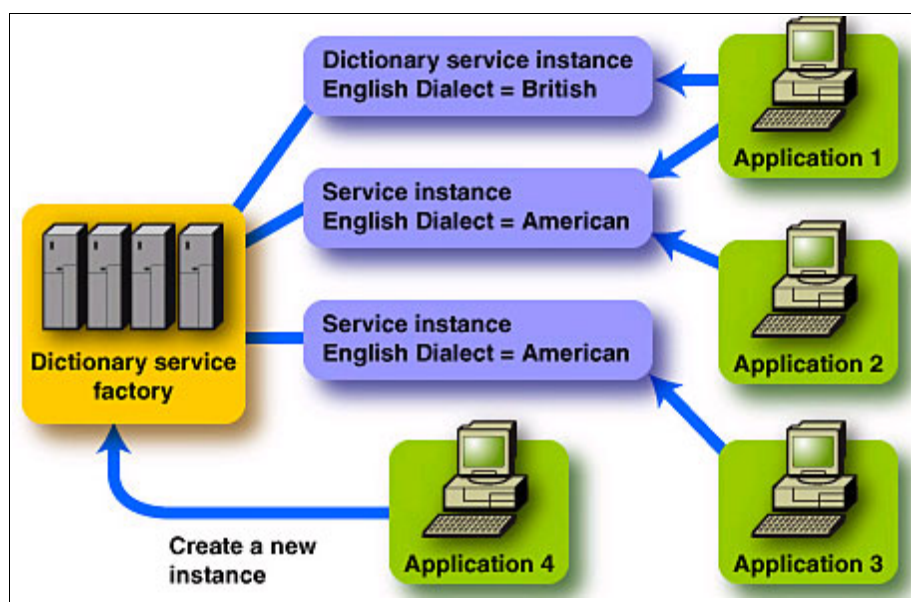


Figure 7-14 The grid service factory

Grid services add other enhancements to Web services, such as notification capability. Over time, it is likely that many of these enhancements will be incorporated into the standards for Web services. Much of what differentiates grid services from Web services today will disappear and we will not refer to grid services, but rather, just Web services.

In addition to Web services and grid services, the technologies and standards that you need to understand include the following: XML and XML Schema, SOAP, WSDL, UDDI, WS-I Basic Profile, WS-Security, Open Grid Services Architecture (OGSA), and Open Grid Services Infrastructure (OGSI).

Open Grid Services Architecture (OGSA) and Open Grid Service Infrastructure (OGSI)

The Global Grid Forum (GGF) developed OGSA and OGSI. OGSA defines the structure of a grid, what grid services are and what they should be able to do, and the technologies on which they should be based. OGSI is the specification for the concepts covered by the OGSA.

OGSA defines the components necessary for a grid and their functions. Figure 7-15 on page 111 illustrates this structure.

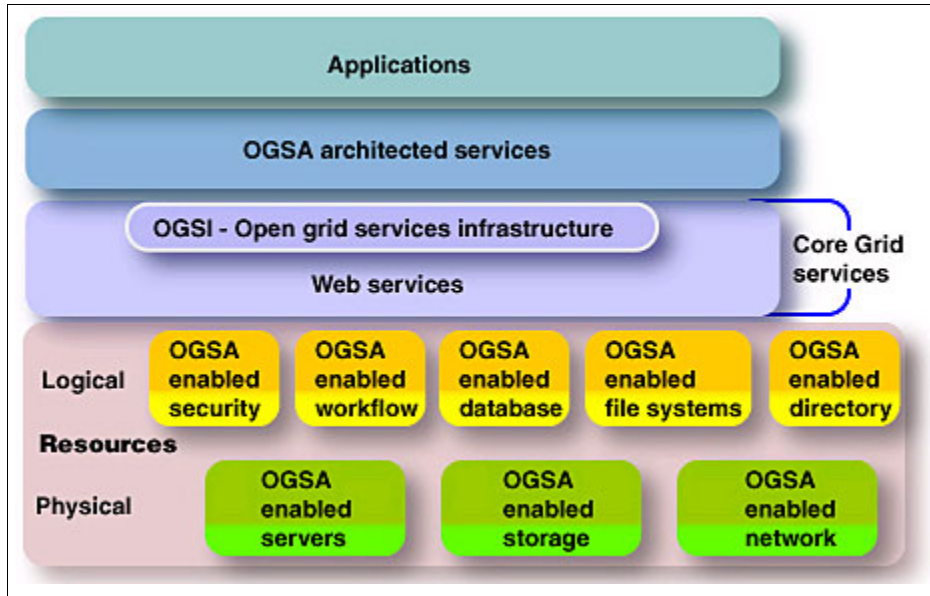


Figure 7-15 The components necessary for a grid and their functions

This structure uses four main layers, which are described in Table 7-2.

Table 7-2 OGSA layers

OGSA layer	Description
Resources	Both physical and logical
Grid Services	OGSI-compliant enhanced Web services that are called grid services
OGSA-architected Services	The core functions of a grid, covering such issues as management, communications, policy services, and security
Grid Applications	The grid applications that take advantage of the grid services and resources available

OGSI provides the technical details for creating grid services and other grid components as described by the OGSA. This specification deals extensively with Web services standards such as SOAP and WSDL, and describes the enhancements necessary to create grid services

Building a grid

As with many emerging technologies, tools explicitly designed to build and work with grids are only beginning to emerge. Because grid services are an enhancement of Web services, you will likely use many of the same tools that you might use to create Web services.

Figure 7-16 on page 112 shows some of the vendors that are developing tools that relate to specific areas covered by the OGSA.

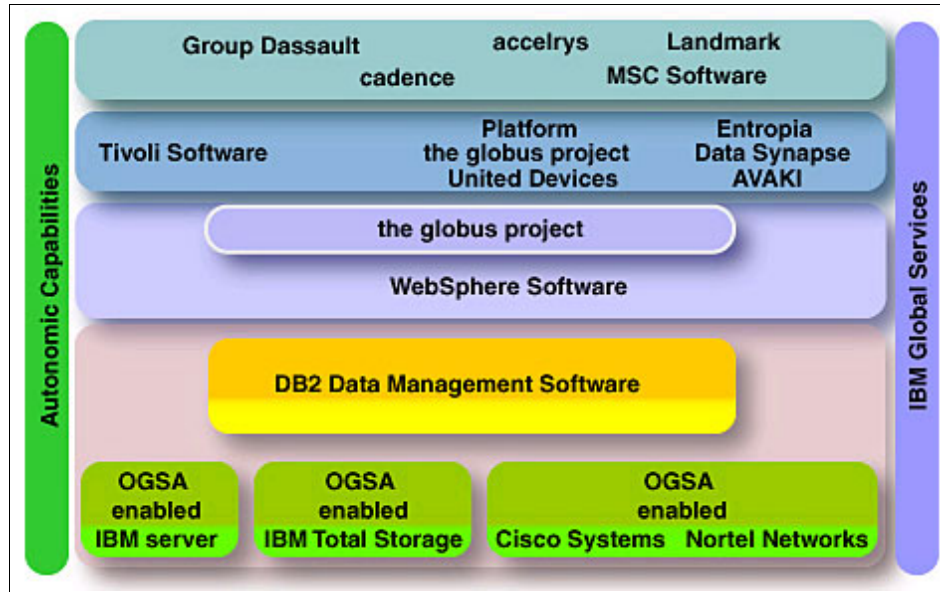


Figure 7-16 A sampling of vendors developing tools related to specific areas of OGSA

The Globus Toolkit from the Globus Project is an open-source implementation of OGSI. It provides software services and libraries for security, information infrastructure, resource management, data management, communication, fault detection, and portability. The toolkit is an infrastructure upon which you can build a grid. IBM alphaWorks® offers the IBM Grid Toolbox. The toolbox is a set of tools and software for creating grids and the applications that make use of them.

To take an existing application and enable it for grid computing, you must first understand what a grid is and what it can and cannot do. You need to understand the infrastructure of a grid, the services that are provided, and the services that are not provided. All of these factors can affect the application in question.

Although massively parallel applications can certainly take advantage of grids, other types of applications can also be good candidates. Simply taking advantage of unused processor resources could benefit some applications. Applications that require large amounts of data storage could also benefit, depending on the application and the grid.

Whether you are designing a new application for use on a grid or considering legacy applications for grid enablement, you need to know if and how the grid meets the needs of the application in regards to the following factors: security, resource management, information services, and data management.

In addition, you should also consider factors such as performance, reliability, and network topology. In many cases, you can create any needed services and facilities that are not provided. In some cases, legacy applications may have to be ported if they were originally tied to specific resources. There are multiple approaches to designing grid applications. Here is one approach:

1. Isolate computationally intensive methods in your application.
2. Design grid services that can wrap around those methods.
3. Alter your application so that it calls the new grid services instead of the original methods.

In this setting, computationally intensive methods from your application are actually being run on other computers. In some ways, this is similar to Java's Remote Procedure Call (RPC). In complex scenarios, the grid services could reside on numerous computers within the grid.

When the application needs to run a method that is encapsulated by a grid service, it can directly contact the grid service or it can contact a piece of middleware to determine which grid service on what computer it should contact. This middleware could also provide scheduling and workload management functionality.

7.3.3 Utility computing

Companies today are building their business strategies around Internet-based technologies, carefully choosing solutions that enable them to operate with agility and speed in what is rapidly becoming an on demand world. At the same time, they require that information technology to contribute in measurable ways to the creation of value across the organization and deliver a solid return on investment (ROI). Utility computing offers a compelling opportunity for companies to merge business with IT in support of their strategic goals, whether they choose to establish their own internal utility or leverage the increasing number of utility services available from IBM.

Note: The IBM On Demand Business Glossary defines utility computing as “one of the features of the On Demand Business environment that delivers computing power to companies as they need it, and only for as long as they need it-making it as reliable, affordable, and easy to use as common utilities.”^a

a. Source: http://www-306.ibm.com/e-business/ondemand/us/toolkit/glossary_a.shtml

IBM clients have realized that they can better manage their computing resources and save money by using pay-as-you-go computing services. Instead of paying for the infrastructure supporting enterprise applications, companies buy access to those applications on an as-needed basis from expert providers. This leads to tremendous cost savings as well as greater business flexibility.

Electric utilities and utility computing have much in common. With a power company, the generation of the power is centralized and controlled by the power company. With utility computing, the computing power and its creation is centralized and controlled. With a power company, clients plug in to a standard wall outlet to receive power. With utility computing, clients access computing resources by plugging in to the network. Utility computing standards would dictate how clients access the network. And just as different types of outlets, cables, circuit breakers, and more exist for the different types of power clients and their needs, there are differences in the standards that utility computing clients use, depending on their size and their needs.

Not all clients are the same. A large business has different power and computing needs than a residential client. By the same standards, large clients can probably expect more attentive service based on their consumption and needs versus a smaller client. Just as service level agreements (SLAs) are common with large businesses receiving power from power companies, SLAs are also common among large businesses using utility computing services.

At its most basic level, utility computing is geared to make computing resources available to businesses in the same way that power resources are available. When you need more computing, you can get it. And when you need less, you need not pay for extra capacity. Utility computing is about making computing resources simpler to access and more affordable to use.

IBM is helping to lead the shift to utility computing, the delivery of business processes, applications, and infrastructure based on service levels aligned with business priorities. Through the IBM On Demand Business initiative, IBM has created the IBM Universal Management Infrastructure (UMI), the integration of IBM products (hardware and software), architecture, and best practices into a range of solutions for building and managing

utility-based environments to meet client-specific needs and preferences. Based on open standards and delivered through a new category of IBM Global Services offerings, the UMI affords businesses the flexibility they need to take advantage of utility computing today, wherever they are in their journeys toward becoming On Demand Business enterprises. IBM works closely with each client to determine the best approach for implementing a UMI-based solution in their organization, drawing on a full range of offerings that increase with the UMI's expanding set of capabilities.

In the utility computing vision, computer resources flow like electricity on demand from virtual utilities around the globe. In this vision, utility computing is dynamically provisioned and scaled, self-healing, self-managing, secure, always on, and efficiently metered and priced on a pay-as-you-go basis.

7.4 Autonomic computing

In an On Demand Business, IT professionals must strengthen the responsiveness and resiliency of service delivery, improving quality of service while reducing the cost of ownership (TCO) of their operating environments. Yet the IT components of today are so complex that the administrators are challenged to provide a stable IT infrastructure. As networks and distributed systems grow and change, system deployment failures, hardware and software issues and human error increasingly hamper effective systems administration. Human intervention is required to enhance the performance and capacity of components in an IT system, driving up overall costs; even as technology components continue to decline. Autonomic computing helps address this complexity and offers improved quality of service delivery by using technology to manage technology.

Automation is the goal, the benefit clients will achieve, and autonomic computing is the discipline and enabling technology that gets you there. Autonomic computing is the driver for the development of advanced technologies (autonomic technologies) that are embodied by the IBM automation offerings, as well as other products.

Autonomic computing provides the technology to enable information systems to be self-managing. These self-managing characteristics combine to deliver the automation required of an On Demand Operating Environment. Autonomic technologies are the components “inside,” and automation is the end result that is visible “outside” to the client.

Autonomic computing is about the IT self-management and it is defined by four characteristics that define its components:

- ▶ Self-configuring: Ability to adapt to dynamically changing environments
- ▶ Self-healing: Ability to discover, diagnose, and act to prevent disruptions
- ▶ Self-optimizing: Ability to tune resources and balance workloads to maximize the use of information technology resources
- ▶ Self-protecting: Ability to anticipate, detect, identify, and protect against threats.

An autonomic computing system should ultimately be able to run itself with minimal human intervention.

As its central theme, the autonomic computing architecture defines a control loop that handles all events in the system. The control loop, manifested as an *automatic manager*, performs the following functions (MAPE):

- ▶ Monitor: First, the system looks for the events, detected by the sensor from whatever source, be it a log file or an in-memory process. The system uses the knowledge base to understand what it is looking at.

- **Analyze:** When an event occurs, the knowledge base contains information that helps to determine what to do about it.
- **Plan:** After the event is detected and analyzed, the system needs to determine what to do about it using the knowledge base. The symptom database might have information, or a central policy server might determine the action to take.
- **Execute:** When the plan has been formulated, it is the effector that actually carries out the action, as specified in the existing knowledge base.

Figure 7-17 shows a common illustration of the control loop.

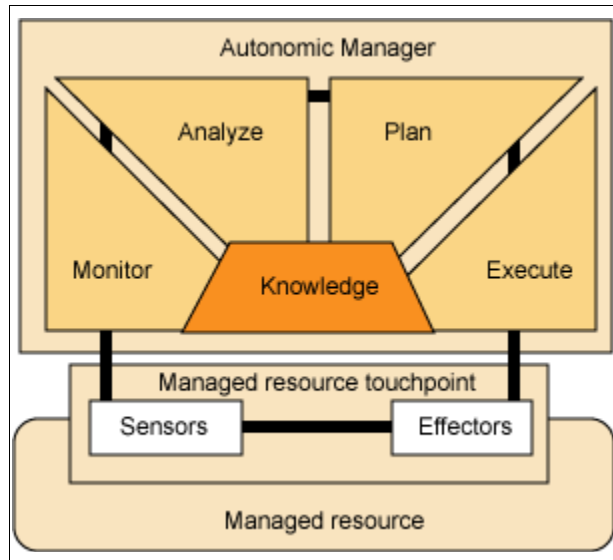


Figure 7-17 The control loop

These functions both consume and generate the *knowledge* about managed resources. The knowledge base can be initialized with known information about the system and it can grow as the automatic manager learns more about the characteristics of the managed resources. The four functions continually share the knowledge that ultimately leads to better decision making by each of the functions.

The knowledge comes from two sources: the sensors (monitoring and logs) and from a set of predefined scenarios. It is also feasible to have a database of symptoms and corrective actions. For example, a quick lookup of a “database servers is down” symptom may have “reboot the server” as its corrective action.


Although autonomic computing is relatively new, automatic manager features are currently available in some tools and products.

For example, DB2 uses autonomic computing to monitor the health and maintain optimum performance of the database system. If any performance issues are detected, DB2 will report the findings and offer expert advice on how to correct the situation.

The Intelligent Management Software solution in Tivoli contains all four areas of the autonomic computing environment. Elements of the toolset can self-configure (Configuration Manager), self-optimize (Workload Scheduler), self-heal (Enterprise Console) and self-protect (Risk Manager). The Enterprise Workload Manager (EWLM), a component of IBM Virtualization Engine, enables automatic monitoring and management of multi-tiered, distributed, heterogeneous, and homogenous workloads across an IT infrastructure.

Service level automation and orchestration provide services that facilitate the translation of quality of service policy declarations associated with business services into reality. This is achieved by services in implementing autonomic managers, which monitor the execution of services (more precisely, of services instrumented to be managed elements) in the On Demand Operating Environment according to the policy declarations they receive.

Many specializations of such services exist, focusing on managing, such as availability, configuration, or workload for the managed elements, provisioning resources, performing problem management, handling end-to-end security for On Demand Operating Environment services, or managing data placement.



On Demand Operating Environment: architectural elements

This chapter contains descriptions of the key elements of the On Demand Operating Environment architecture. The elements are described in glossary form in alphabetical order.

8.1 Overview of ODOE architecture and services

Figure 8-1 illustrates the high level overview and the composition of the ODOE architecture and services. This chapter provides a glossary for the terms shown in this figure.

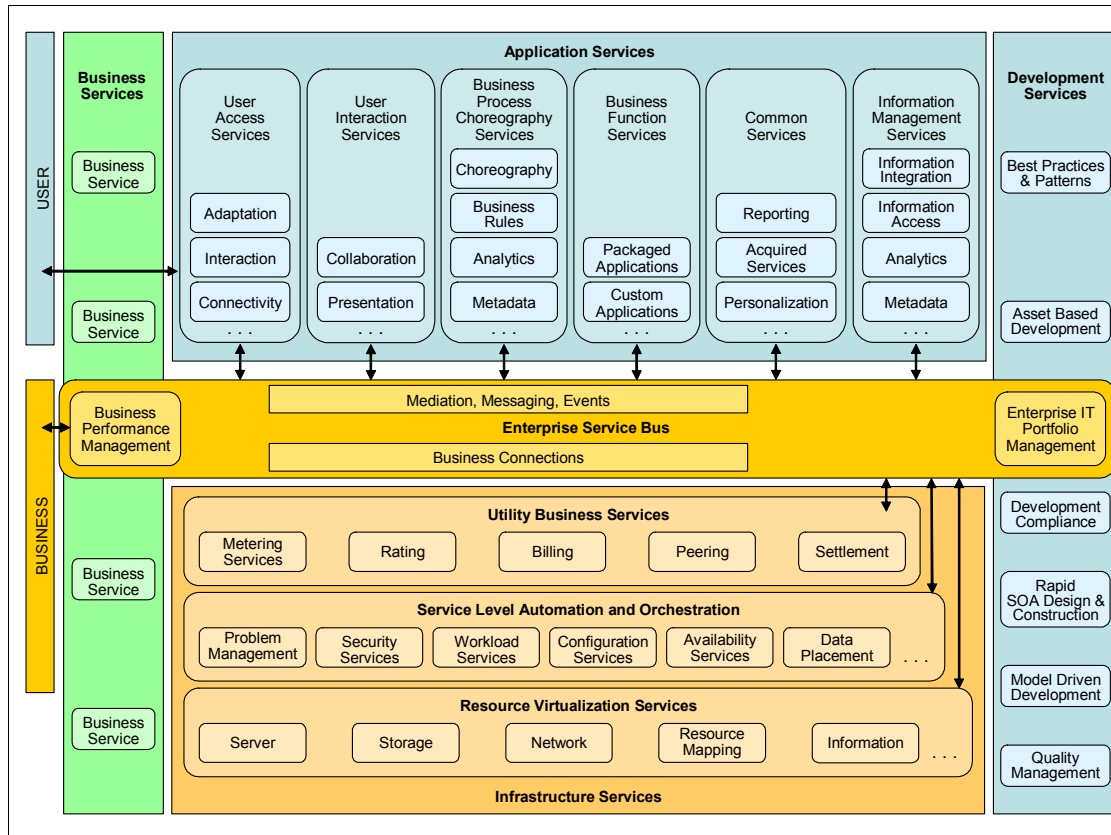


Figure 8-1 The On Demand Operating Environment architecture

8.2 Application services

The application services produce containers that host integration services and business services and provide facilities to simplify their participation in interactions with other integration services and with On Demand Operating Environment infrastructure services.

8.3 Business

Business is an external application system that plays a role in the context of a business service interaction through a programmatic linkage. Business might be a consumer of a service from the enterprise or a provider of a service to the enterprise. Business can also encompass entities internal to the enterprise or external to it. For example, a geographically-dispersed, large enterprise can have multiple business units in various geographies, each of which might have its own systems and architectures with a need to do business with its counterparts in other geographies.

The consumer component is business that is interested in programmatically integrating with a service that the organization under consideration provides. Consumer's requests to external systems can be asynchronous or synchronous in nature.

The provider component is the business that provides certain business functionality that the organization under consideration is interested in leveraging by establishing programmatic linkage.

8.4 Business function services

A business function service implements a business function and hides the detail of its implementation. It is the functional basis for a business service and can expose its underlying function as a service or can be used directly as a component in the choreography. The business function service can be operational or analytical in nature. Custom applications and packaged applications are examples of business function services.

Custom applications are business applications that have been created within an enterprise. In most cases, they are fairly old in nature and have business logic embedded within them. Though some of these applications can encompass many business processes and cross multiple functional areas within a business, most of these applications cover only a certain aspect of the business.

Packaged applications are business applications whose source or runtime code is purchased from an external application vendor. Examples of packaged application vendors include SAP, Oracle, and PeopleSoft. These applications typically handle multiple functions within a business, though specialized packaged applications exist as well. Most of these applications encompass business logic and business processes.

8.5 Business performance management services

Business performance management services enable business managers to create business strategies with clear and measurable goals, turn these strategies into action plans and business policies, monitor the performance of these policies to assure the Key Performance Indicators (KPIs) are met, analyze the results of these plans to better understand performance drivers, and enable the communication of these results to various stakeholders. The overall goal of the business performance management layer is to enable a sense-and-respond environment, or more ambitiously, an anticipate-and-preempt environment.

In Figure 8-1 on page 118, business performance management is positioned at the intersection of ESB and integration services.

Business Performance Management (BPM) addresses the requirements of businesses to understand what is affecting their performance (for example, whether it is people, processes, infrastructure, or assets), understand why it is having that effect, and take corrective action to achieve the desired performance. A complete business performance solution is realized through a set of business practices, methods, and software built around a consistent and extensible architecture that integrates with and leverages existing investments.

Business performance management is based on two concepts.

- ▶ First, it is about aligning the business from strategy to process management to business operations to IT operations. The alignment enables management and employees to understand how their business function needs to perform within the overall objectives of the business (vertical alignment) and how their function fits with peers (horizontal alignment).
- ▶ Second, it is about enabling a cycle of continuous improvement and innovation. This cycle consists of five activities: *modeling* the business needs, *deploying* the models, *monitoring*

the business and IT operations in real-time from internal and external sources to determine performance levels, *analyzing* various aspects of business performance (answering what, why, and how), and taking *action* as needed to achieve performance objectives.

Business Performance Management is a real-time, model-based discipline to proactively and reactively optimize and adapt business operations and IT infrastructure based on dynamic business performance targets.

It is supported by:

- ▶ A Business Activity Workplace
- ▶ Modeling, Monitoring, and Analysis Tools
- ▶ A Common Event Infrastructure
- ▶ An Event Correspondence Engine
- ▶ A Business Activity Warehouse

The BPM core capabilities can be grouped into three parts:

- ▶ Information Management (Analytics/Reporting and Information Integration)
- ▶ Business Service Management (IT and business alignment and Service Management, Automated Orchestration)
- ▶ Process Management (Process Monitoring, Process Modeling and Process Execution)

The three facets of the On Demand Operating Environment (ESB, application services, and infrastructure services) provide the capabilities required to enable business performance management or management of business services to meet business goals such as the KPIs identified in the analysis phase of business service implementation. Application services are instrumented to produce business events that can be used to calculate KPIs and other metrics relevant for the management of the underlying business service. In addition, business service policies describe the expected behavior of a business service and eventually define rules for dealing with situations where those expectations are not met. Some examples of business events are business process completion, rollback, or manual intervention. A KPI might be 95% of all purchase order processes successfully completing without manual intervention.

8.6 Business process choreography services

Business process choreography services support the execution of other services that express their behavior using process flow or rule technology. Process flows, for example, are used to describe the interaction of other services (almost any of the integration kinds, including other process flow services) to perform the tasks required to realize the functions offered by the new (combined or aggregated) business service.

The services encode the rules for sequencing of operations provided by those services and responsibilities of internal or external process participants for certain tasks of the underlying process. Choreography services execute the service's specification to fully automated, or include interactive tasks that require interactions with users. Choreography and business rules are two types of business process choreography services.

Choreography defines the flow of information exchanges among a set of internal or external participants (user or business) to implement a business process that is composed of one or more services. These services are typically Web services, but they can be generic services as well. Orchestration is typically used in the context within an enterprise, while choreography

is used in the context of a virtual enterprise. IBM believes these are equivalent terms given the blurring of the boundaries of a business process.

Business rules encode decisions that are externalized from services such as process choreography scripts. They establish the variable and conditional nature of a (process) service by describing the decisions to be made and, eventually, the set of actions to be taken in the case of a certain event occurring in the service or caused externally. Rule and policy externalization is critical to the On Demand Operating Environment by enabling customization of existing services to meet new business requirements, instead of forcing a new implementation for each new service and solution.

8.7 Business services

Business services are the various externalized functional service offerings that have been defined, configured, and deployed in the operating environment. A business service is the touch point for the user or the external system, and is in reality the aggregated view of the business process that is choreographed out of functional services. Business services are identified and defined through mechanisms such as Component Business Modeling (CBM).

8.8 Common services

A common service is a functional or an infrastructural service that more than one service uses. A common service can be acquired and used as is, customized after acquisition, or built from the ground up. Examples of common services include acquired services, personalization, and reporting.

Acquired services are provided by an entity external to the enterprise (typically hosted by that entity as well) and are used by the enterprise in one or more business processes. These are the “utility” services the external entity offers to the enterprise under consideration.

Personalization includes services that enable another service to tailor its output based on an understanding of the user profile and preferences. Personalization is not the same as customization, which is really a user-controlled action to modify the interaction to suit his or her needs, as opposed to being done by the system itself.

Reporting covers the set of services that provide framework-type services for various applications generating reports targeted at users of all kinds. These services support both operational and analytical type reports.

8.9 Development services

The development services component of the ODOE enables a team of executives, project managers, architects, designers, developers, integration specialists, testers, and system administrators to collaborate in a globally distributed environment to design, construct, integrate, and deploy applications in the operating environment. The assets used throughout the business driven development cycle are managed in shared repositories and these assets are managed using the Rational Team Unifying Platform. Traceability links can be established between the assets so that changes that need to be made due to evolving requirements can be tracked for compliance purposes as well as to improve the quality and predictability of the application development process. The IT assets, as well as related project management information, is also captured and managed as part of the Enterprise IT Portfolio Management Service.

8.10 Enterprise Service Bus (ESB)

An ESB provides the infrastructure that enables mediated interactions between all services. The ESB supports event-based interactions as well as message exchange for service request handling. In both cases, mediations can facilitate interactions, such as finding services that provide capabilities a requestor is asking for, or taking care of mismatches between capability-wise compatible requesters and providers. Business connections, mediation, messaging, and events are examples of ESB services.

Business connections provide intra-enterprise adapter services and B2B gateway services, enabling On Demand Business services to interact with intra-enterprise and inter-enterprise applications both on the business and infrastructure level. Note that process coordination eventually needed for some B2B protocols (for example, RosettaNet) require additional services provided by the business process choreography layer of the architecture.

Mediation, messaging, and events are different facets of service interaction management the ESB provides. Mediations match service requests to service providers to enable the service provider and requester to interact with each other. This includes support for dynamic match making in service discovery scenarios. Service requesters and providers interact by exchanging messages in synchronous interactions. ESB services enable the brokering and routing of messages from a service provider to a service requester. Interactions can also be through events. In this case, requesters publish events not knowing (or caring) who will receive them. Providers register their interest in events, satisfying particular filter criteria, and the ESB facilitates the match making between event producers and consumers along those lines.

Figure 8-2 on page 123 shows IBM products on the Enterprise Service Bus.

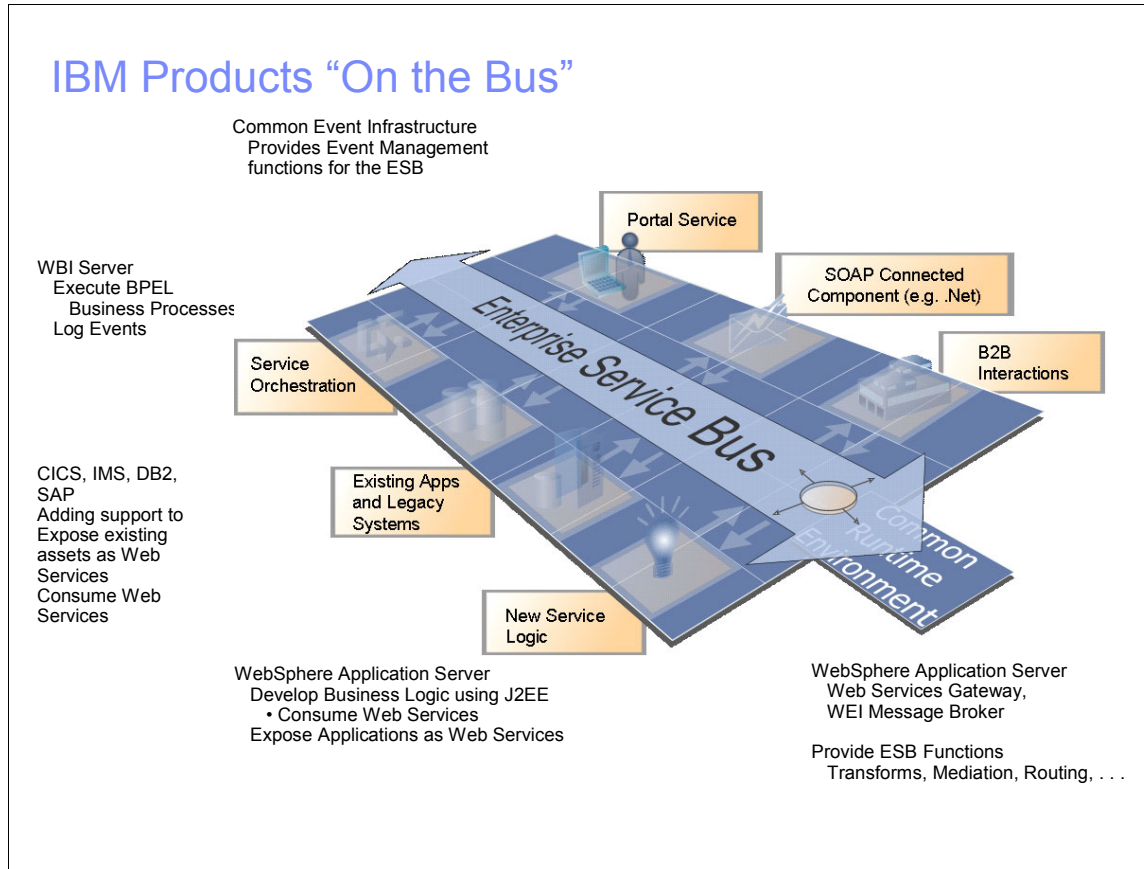


Figure 8-2 IBM products on the Enterprise Service Bus

8.11 Information management services

Information management services provide a uniform way of representing, accessing, maintaining, managing, analyzing, and integrating data and content across heterogeneous information sources.

Analytics services support analysis of information available in various forms and stores in an enterprise. Examples include databases, flat files, XML files, and spreadsheets. These services include both real-time analytics (such as scoring), exploratory algorithms (such as data mining), and decision support capabilities (such as OLAP and warehouse reporting).

Information integration services provide the ability to integrate heterogeneous data and content sources across and beyond the enterprise. In addition, they allow for data movement, transformation, and synchronization across heterogeneous-distributed databases.

Information access services provide a uniform means for applications to access a wide variety of stored information through standard APIs, such as JDBC/SQLJ and ODBC. Emerging standards for native access to XML and content are under development. Query and search are supported across relational, XML, content, and text-based sources.

Metadata services manage both technical and business information regarding data meaning and data relationships. Business and data relationships are also often represented as hierarchies in metadata, which in turn support user navigation of the data. Data about the validity and quality of the information might also be stored, as well as frequency and currency

data, schedules, and general environment management attributes. Meta-tagging supports the process of indexing, classifying, and tagging of unstructured information into a consistent taxonomy, primarily text documents and other similar objects.

8.11.1 Infrastructure services

Infrastructure services provide and manage the infrastructure into which business services and their constituents are deployed. They can be categorized as utility, service-level automation, and resource virtualization services. See the individual sections for a more detailed description of those categories.

Infrastructure services exist in application containers just like integration services, but in contrast to integration services, the parameterization of those containers is not exposed in the On Demand Operating Environment application programming model. Also note that infrastructure services are constructed using the same principles (and tools) as business services: process choreography, adapters, business rules, and mediations -- all that is relevant when building and managing infrastructure services.

8.12 Resource virtualization services

Resource virtualization services provide the ability to aggregate pools of resources into a logical view that enables and delivers increased utilization of resources, simplified management, and improved availability of resources while extending access to the application.

Network virtualization services enable the virtualization of the physical network using capabilities like VPN, VLAN, and so on.

Resource mapping services extract client legacy resource repositories and transform them into canonical resource types for resource composition in support of business service deployment and autonomic management interaction with On Demand Business resources during runtime.

Server virtualization services enable the virtualization of the physical servers across the infrastructure, using capabilities such as clustering, partitioning, and virtual machines.

Storage virtualization services enable the virtualization of the persistent information across the distributed environment, using such capabilities as data grids.

Information services provide the means to manage and exploit information represented by documents, e-mail, images, music, and other unstructured data. These services coordinate and enforce policies describing the life cycle and management of the information, including access, security, versioning, archiving, and retention.

8.13 Service-level automation and orchestration services

Service-level automation and orchestration services enable the system resources to self-configure, self-heal, self-optimize, and self-protect themselves. These functions are enabled by a set of services that are provided by autonomic managers and resource managers.

The autonomic manager receives and processes raw resource sensor input through its monitor component. It stores the resulting data in its knowledge base, where it can be further

refined or operated upon by modules that analyze the data to evaluate current system and resource behavior for compliance with its established policy. When system behavior is not consistent with overall goals, the autonomic manager evaluates alternative courses of action to effect changes in the set of configured resources in its sphere of influence and selects a plan of action in accordance with policies stored in the knowledge base. The autonomic manager then invokes the execute functions, either by interacting with underlying managed resources, or by communicating with other autonomic managers responsible for other resources in the system. This behavior pattern of autonomic behavior in an On Demand Business system is called the MAPE loop.

Resource managers are responsible for responding to configuration change directives from higher-order autonomic service-level managers. The resource managers are in effect factories for creation and management of instances of their supported resource types. Through this component-model behavior, you can virtualize logical resource instances that are dynamically bound to underlying physical resource topologies on demand. Each logical resource is itself a service and has an identity for distributed state management and interaction. Examples of services associated with service-level automation and orchestration include availability, configuration, problem management, security, workload, and data placement.

Availability services let you manage the availability of the various infrastructure components within the On Demand Business environment on a case-by-case basis, based on availability-related, service-level agreements. This might range from simple monitoring for server or software failures with automatic restart, to hot standby or failover solutions, such as HACMP. Availability management also includes backup and restore (for example, ADSM), data mirroring and RAID deployment, and business continuity and disaster recovery provisioning. The overall objective and purpose of availability management is to provide a policy-declared level of resilience to the deployed solution.

Configuration services provide the ability for the On Demand Business environment to adapt itself to changes in the infrastructure, with minimal human intervention, based on goals and policies specified by the offering or provider administrator. This property needs to permeate the infrastructure from the highest level service down to the lowest level resource that supports that service.

Problem management services provide appropriate logging and tracing facilities that are designed and deployed within the policy and service-level management components of the environment, to permit the debugging of the system's behavior when SLAs are violated for no apparent reason.

Security services provide the ability for the On Demand Business environment to achieve self-protection. Security is managed on a case-by-case basis for the various service instances that are provisioned within the infrastructure based on SLAs, SLOs, and policies. In an On Demand Business environment, it is not only sufficient to detect the intrusions but also important to be able to react dynamically and prevent further damage. The security architecture of each business service must also be auditable. This is for the benefit of users, the utility provider, and law enforcement. It is also necessary, for security reasons, for various events (logons, logoffs, Web hits, and so on) to be logged and retained for certain periods of time as required by law enforcement.

Workload services provide the ability to balance performance and workload in the infrastructure when the aggregate load on all of the deployed On Demand Business service instances exceeds the installed capacity of one or more resources provisioned in the environment. In this case, resource arbitration determines which instances will get the constrained resources and which ones will "suffer" based on the SLAs and policies that are in effect for the affected instances. Overall performance management is achieved through a

combination of balancing, scheduling, and the provisioning of additional resources in order to best meet the performance-related goals across the various classes of running the system.

Data placement services handle creation, maintenance, and destruction of caches and replicas of data. They monitor query streams in the system, looking for opportunities to use caches and replicas to improve overall system performance. Placement policies that govern location and nature of caches and replicas control their decisions.

8.14 User

The user is a human playing a role in the context of a business service interaction using appropriate access channel devices. The user could be a user directly interacting with a business service, an employee acting as a proxy for the user, or an employee who is the user. User examples include clients, partners, suppliers, and employees.

8.15 User access services

User access services provide mechanisms to enable differing device types, modes of interaction, and connection topologies to seamlessly participate in end-to-end solutions with the On Demand Operating Environment. Examples of user access services include adaptation, interaction, and connectivity.

Adaptation services enable varying device capabilities based on CPU speed, RAM, persistent store, display size, operating system, processor instruction set, and so on. This includes desktops, laptops, and pervasive devices.

Interaction services enable a spectrum of user-interaction modalities, including single modes such as visual, manual, and audible interactions. Additionally, it enables combinations of these as well as differing degrees of “richness” and styles of interaction.

Connectivity services enable a range of topologies based on usage patterns, connection QoS Bearer network protocol, mobility, location and presence information, geographic coverage, connection billing models, domains such as single enterprise or multi-enterprise or service provider, and corresponding security models.

8.16 User interaction services

User interaction services provide the presentation with capabilities for the user to interact with the business service. These include presentation services, collaboration services, search services, and content subscription services. Examples of user interaction services include collaboration and presentation.

Collaboration services enable the interaction of users with other users and are an inherent part of the human interaction. They are broadly classified into chat collaboration (such as e-mail and chat) and team collaborations (e-meetings and team-rooms).

Presentation services enable the formulation of business services in a form recognizable and understandable by a user, independent of user-access service used. They enable the translation of the user-entered data into information the various services can process.

8.17 Utility business services

The utility business services layer defines what usage of which resource or service is to be metered, defined, and allowed to have rating packages applied. This provides supporting functions for this usage. Examples of utility business services include rating/billing, metering, and peering/settlement.

The rating/billing component provides the ability to translate technical measurements into monetary units, and then bill the subscriber appropriately. It is the process of calculating the cost or price of a resource by using its rating package (defining, for example, price per consumption) and a given metering record that measures the consumption of that resource. Additionally, penalties for Service Level Agreement (SLA) violations, if any, must be processed so that they can be included in the subscriber's bill.

Metering services provide the ability to enable the collection of information related to the subscriber's service and resource utilization. This utilization is expressed in terms of resource usage or consumption. The collected information, which is produced by the metering service, is defined in a meter event. These meter events form the basis for the billing of subscribers as well as cost accounting and resource utilization reporting, including the settlement of charges between different service providers for the usage of On Demand Business services or resources.

Peering/settlement are both processes similar to rating and billing. Instead of billing a subscriber for the usage of the On Demand Business service, these processes perform accounting operations for resources and services the business service itself uses. Peering and settlement are both transparent to the subscriber of the business service.



Security in an On Demand Business

This chapter describes security in an On Demand Business environment. It has the following subtopics:

- ▶ On Demand Business and security
- ▶ Web services security
- ▶ Federation for interoperable business identities
- ▶ Federated identity management standards
- ▶ Standards and products
- ▶ On Demand Business security reference architecture

9.1 On Demand Business and security

Today, enterprises are continuing the On Demand Business evolution by developing the business model agility needed to create value and demand for their new products and services. For the past 10 years, these enterprises have been hyper-connecting their businesses, processes, clients, and suppliers to gain competitive advantage. This hyper-connectivity is how the life support system of business speed and value. This connectivity brings with it the administrative burden of connecting more users to previously guarded applications, with the pressure of smaller administrative staffs and lower expense targets.

As shown in Figure 9-1, risks and threats have similarly evolved that need to be cost-efficiently mitigated by the proper use of security services, hardware, and software in order to take advantage of On Demand Business functionality.

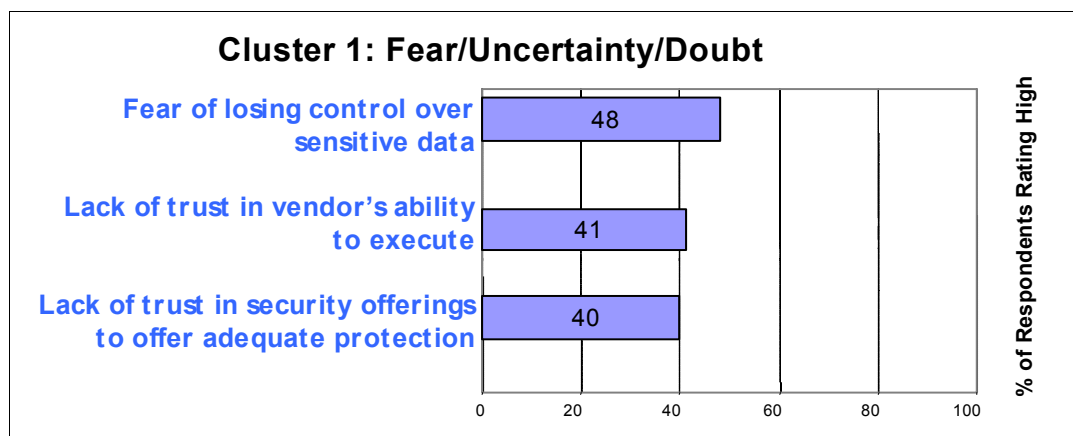


Figure 9-1 Fear, uncertainty, and doubt

9.1.1 The role of security in an On Demand Business environment

In an on demand world, change happens faster and more unpredictably than ever before. To stay competitive, an organization needs to gain the speed, flexibility, and resilience to handle whatever the market does next. On Demand Business allows organizations to lower costs, increase revenue, and respond quickly to industry pressures. It requires changes in the way a company deals with technology, strategy, business practices, and corporate culture. These transformations can run deep, but the potential rewards of operating on demand are enormous.

Achieving leadership in the on demand world requires IBM to create cost-efficient enterprise integrity that mitigates new risks and threats. In a utility-based model, where systems and resources are dynamically shared, connecting the right people to the right resources at the right time is critical to the business process. Maintaining the integrity of who interacts with your business must be ensured for this On Demand Business model to work. In addition, the continuity of the information assets and access to those assets needs to be protected. Managing security processes and policies delivers an effective solution. The promise of On Demand Business added value is in enabling businesses with the capability to take advantage of dynamic market conditions and respond to new client needs.

The security infrastructure for the On Demand Operating Environment (ODOE) will need to be able to support, integrate, and unify popular security models, mechanisms, protocols, platforms, and technologies in a way that enables a variety of systems to interoperate securely. Given the ODOE is a service-oriented framework, securing those services are

paramount to the security of the platform. The security infrastructure should also provide management support for enterprise level security policy management across applications, solutions, and organizations. In a given enterprise, there are various people who contribute to the modeling, development, deployment, and management of the security and privacy aspects of a business application. Tool support is very important to help various people to efficiently execute their responsibilities assigned to the roles they play in an organization.

Taking these into account, the On Demand Business security infrastructure is composed of three parts:

- ▶ A security fabric layer that provides core security capabilities and services in order to minimally secure the On Demand Operating Environment, applications, and solutions
- ▶ A security management discipline layer that provides enterprise level management of security policies and entities, including application security and operational security
- ▶ A tooling layer that supports model-driven security infrastructure to help people be efficient in meeting the responsibilities of their roles in the organization

9.1.2 IT Security fundamentals

You can think of IT security in terms of the following three primary requirements: confidentiality, integrity, and availability (CIA).

- ▶ Confidentiality is the requirement to have sensitive data protected from unauthorized disclosure. This requirement can be further deconstructed into the need for:
 - Encryption of data to guard against eavesdropping
 - Authentication of users to ensure that they are who they claim to be
 - Authorization to enforce access control policy, which determines what users are allowed to see and do
- ▶ Integrity is the requirement that data has not been tampered with and can be, therefore, relied upon for use in business transactions. Some definitions also include an assurance as to the source of the information, while others group this under the area of authentication.
- ▶ Availability is the requirement that systems are operational and data is accessible when it is needed.

Many IT architects only focus on the threat of accidental equipment or software failure; in other words, they deal just with the ramifications of Murphy's Law, which states that anything that can go wrong will go wrong. This attitude ignores an entire class of possibilities that can be equally devastating: the threat due to intentional, nonrandom events caused by a determined adversary.

This latter issue has been referred to as Satan's Law. To read more about Satan's Law, refer to *Programming Satan's Computer* by Ross Anderson and Roger Needham, found at:

<http://www.ftp.cl.cam.ac.uk/ftp/users/rja14/satan.pdf>

The ability to fail over to redundant infrastructure components, for example, can help mitigate the risk from Murphy's Law, but security countermeasures are typically needed to deal with Satan's Law. This creates a link between security and availability that further relates to the resiliency attribute of an On Demand Operating Environment.

9.1.3 Client pain points

IBM is investing heavily in On Demand Business computing. Clients need the flexibility and resilience such an environment offers, but they have concerns as to what this new computing model will do (or will not do). For example, the results of an On Demand Business market intelligence survey found that security is the top concern on the minds of clients and that two of their top four issues deal directly with IT security (see Figure 9-2).

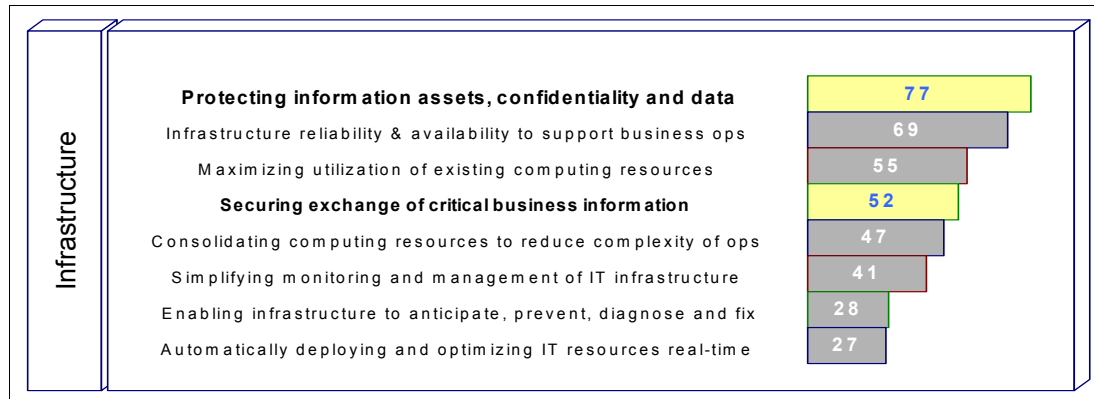


Figure 9-2 Importance of operating environment capabilities

Given the close relationship of security to availability, we suggest that actually three of the responses are related to security. It has been widely reported that the lack of security in Web services standards is a primary reason that this functionality has been confined to small, intranet-based projects where risks can be minimized.

9.1.4 On Demand Operating Environment client goals

One of the biggest challenges facing ODOE clients today is the cost and complexity of user life cycle management. This is also referred to as a *multiple identity account problem*. This challenge becomes even more complicated when the problem space must scale up from that of a single enterprise's own internal systems to one that also includes interactions with the identity management and access control systems of other business partners, suppliers, and clients. Clients need to:

- ▶ Improve and increase confidence in business transactions
- ▶ Establish identity as the basis for security
 - Poor identity management means poor security
- ▶ Lower administrative cost
 - Costs soar with account and password administration, user registration, and help desk support
- ▶ Mitigate risk and meet compliance requirements by:
 - Management of business, legal, and privacy issues with user data (Sarbanes-Oxley, HIPAA, Graham-Leach-Bliley, CA SB1386, Australia Privacy Act, and so on)
 - Management of unauthorized access from former employees, users, and partners who no longer have a business need
 - Audit failures as a result of orphan account exposure identity theft
- ▶ Establish trust
 - No standard mechanism exists to trust identities from third parties

- There is high cost associated with integrating applications that deal with identities

The previous issues all involve the subject of identity management.

9.1.5 Identify pains

The fundamental issue pervading identity management is that every time a user requests an account for access to an application or a system, an IT administrator must intervene manually. This results in a number of client pain points that can increase cost and dilute security:

- ▶ Account creation, deletion, and updating must be done separately in each target operating system, application, database, network access control system, and so on.
- ▶ User enrollment and registration must be handled manually.
- ▶ Determining the appropriate access rights for a given user on a particular system is handled on a case-by-case basis, increasing the likelihood of errors in application of the security policy.
- ▶ Additional help desk staffs are required to deal with managing password resets and new access requests.
- ▶ A given user must remember many passwords, because they are not synchronized across all systems.
- ▶ Users must manually sign on and off each system separately.
- ▶ The ability to track provisioning requests and approvals is lacking.
- ▶ Access rights are not promptly removed when users no longer have a business need for them.
- ▶ No single audit and enforcement point exists for ensuring that access rights comply with security policy.

All of these pains exist even within a single enterprise's own IT environment. However, when linking to the systems of other organizations, additional trust issues arise:

- ▶ Who is the authoritative identity provider for a given user?
- ▶ Do I trust that identity provider?
- ▶ What proof of identity will I require in order for a user to access my systems?
- ▶ Can I automate the process of provisioning accounts so that each user will not have to register separately?
- ▶ How will I know when to de-provision accounts for users for whom I am not the primary identity provider?

9.1.6 On Demand Business security models

An important characteristic of an ODOE is the fact that processes and interactions are highly dynamic. The growth of partnerships in the on demand world is increasing steadily, leading to a corresponding increase in security challenges.

In a business-to-consumer (B2C) or business-to-employee (B2E) environment where consumers and employees communicate with one company as a focal point for multiple partners, it is important to secure access to all involved parties. In business-to-business (B2B) environments, partners and applications must also be used in a secure and reliable way.

Managing identities in this dynamic environment, with many different organizations interlinked, becomes problematic when using today's traditional, static models. For this reason, it is necessary to organize federations in order to propagate identities across multiple organizations dynamically in a seamless management infrastructure.

In such a dynamic environment, trust relationships between partners are essential. Traditionally, IT infrastructures have dealt almost exclusively with their own environments. Those environments have not necessarily reflected the needs of interoperation and integration with other parties. In an ODOE, all parties must interact seamlessly to meet the requirements of a dynamic business. A representation of the Security Triangle (Integration, Interoperate, and Trust) is depicted in Figure 9-3.

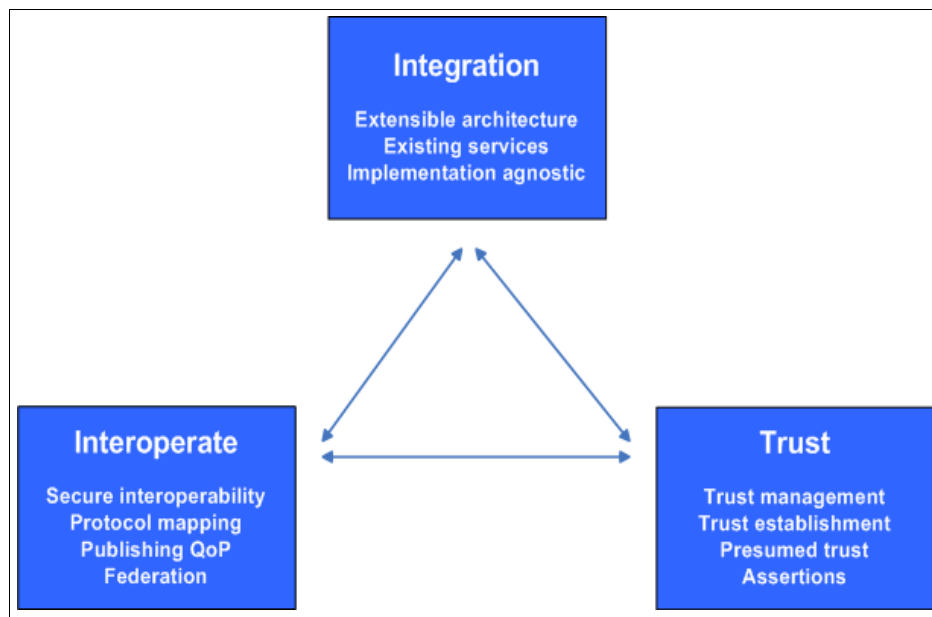


Figure 9-3 Trust as a fundamental requirement in a dynamic security environment

Traditional security issues still apply, but need to be expanded in many ways. In an on demand world, closer convergence of IT and interlocked business processes require flexible architectures to reflect the needs of these virtual organizations (see Figure 9-4 on page 135).

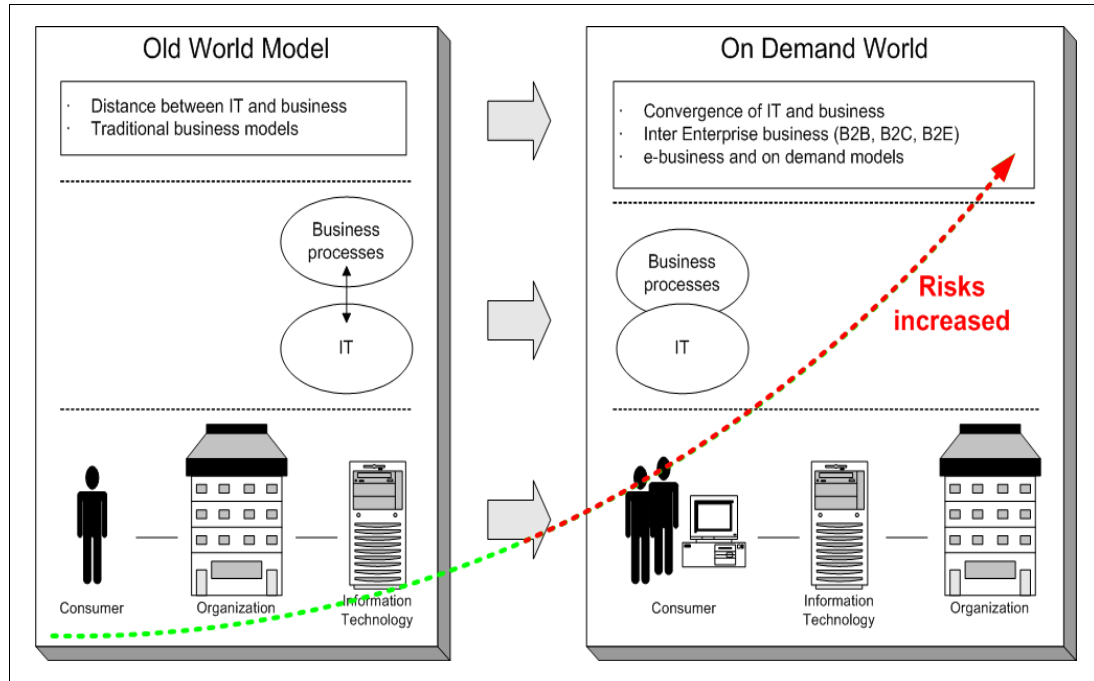


Figure 9-4 New on demand world paradigm for business process

Perhaps the most significant change is the move from a static security environment to a highly dynamic environment that reflect fast changes in this world. These new security challenges span multiple organizations and are no longer bound to persons, but extend to applications and devices as well.

9.2 Standards and products

This section discusses the key concepts and needs of security reference architecture, IBM products and services that meet those needs, and different organizations that have developed security standards

9.2.1 On Demand Business security reference architecture

Some initial work has been done to define a comprehensive On Demand Business security reference architecture. A complete discussion of this architecture is beyond the scope of this redbook, which focuses specifically on the areas of Web Services Security (WSS) and Federated Identity Management (FIM), as shown in Figure 9-5 on page 136.

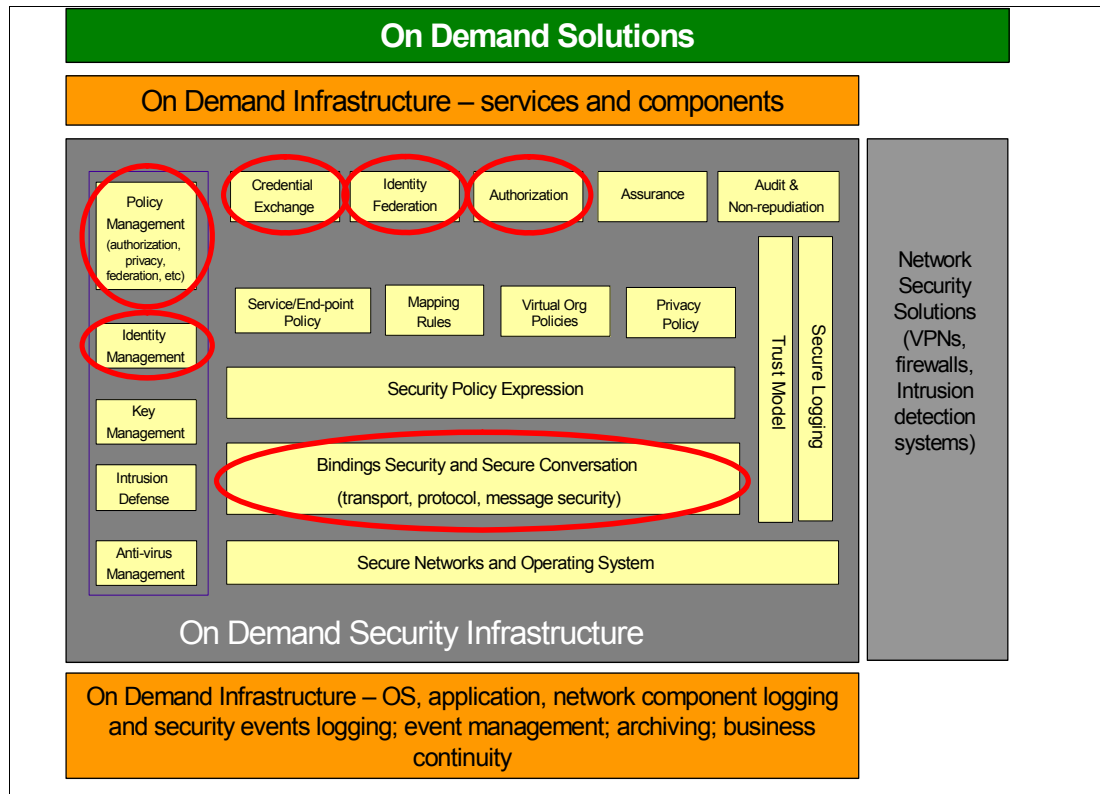


Figure 9-5 The Web Services Security (WSS) and Federated Identity Management (FIM) areas of the On Demand infrastructure

9.2.2 IBM's identity management offerings

IBM offers a scalable, standards-based identity management solution that can speed deployment and help reduce costs. Integration is provided with other IBM core technologies, such as IBM WebSphere Application Server, WebSphere MQ, and Lotus Domino. Security can be extended to UNIX and Linux environments, providing a consistent security implementation across the organization. Figure 9-6 on page 137 illustrates how the products in this family form a comprehensive identity infrastructure.

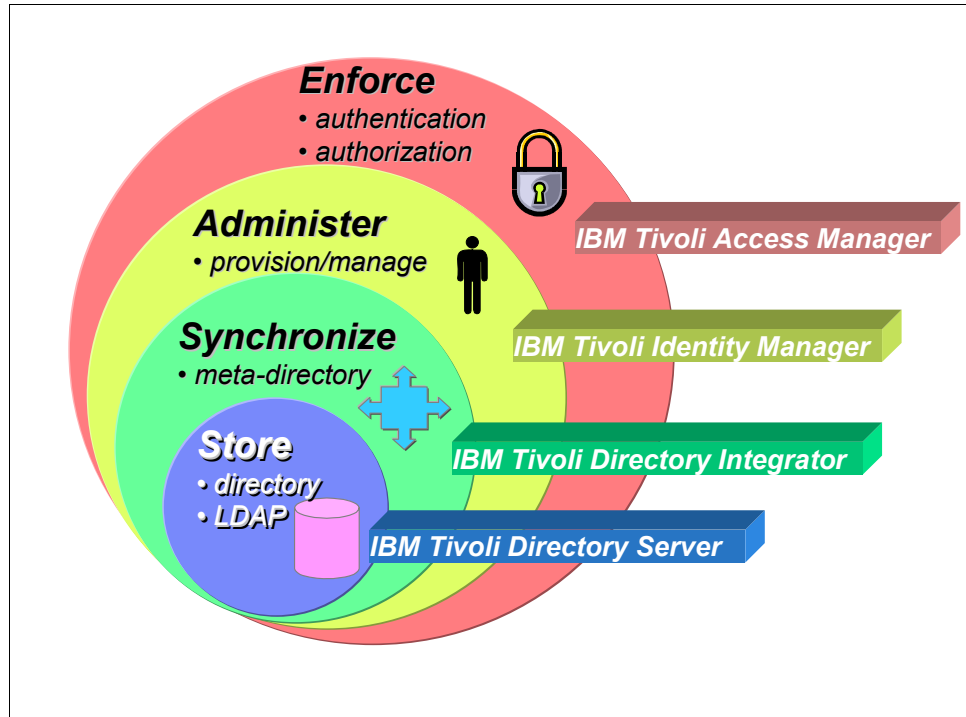


Figure 9-6 IBM's identity management offerings

IBM Tivoli Directory Server

IBM Tivoli Directory Server provides a powerful Lightweight Directory Access Protocol (LDAP) V3 compliant directory that can serve as the foundation for an enterprise identity infrastructure. Directory Server includes strong management, replication, and security features, making it well-suited for mission critical, 24x7 installations.

IBM Tivoli Directory Integrator

IBM Tivoli Directory Integrator synchronizes identity data residing in directories, databases, collaborative systems, applications used for human resources (HR), client relationship management (CRM), Enterprise Resource Planning (ERP), and other corporate applications.

By serving as a flexible synchronization layer between a company's identity structure and the application sources of identity data, IBM Tivoli Directory Integrator eliminates the need for a centralized data store. For organizations that choose to deploy an enterprise directory solution, IBM Tivoli Directory Integrator can help ease the process by connecting to the identity data from the various repositories throughout the organization.

IBM Tivoli Identity Manager

IBM Tivoli Identity Manager provides a secure, automated policy-based user- management solution that helps address key business issues across both legacy and On Demand Business environments. Intuitive Web administrative and self-service interfaces integrate with existing business processes to help simplify and automate managing and provisioning users. It incorporates a workflow engine and leverages identity data for activities such as auditing and reporting.

Tivoli Identity Manager interacts directly with users and with two external types of systems: identity sources and access control mechanisms. The identity sources deliver authoritative information about the users that need accounts. The provisioning system communicates directly with access control systems to create accounts, supply user information and

passwords, and define the entitlements of the account. In reverse, local administrative changes made to an access control system are captured and reported to the provisioning system for evaluation against policy.

IBM Tivoli Access Manager

IBM Tivoli Access Manager for On Demand Business integrates with On Demand Business applications out-of-the-box to deliver a secure, unified, and personalized On Demand Business experience. By providing authentication and authorization APIs and integration with application platforms such as Java 2 Enterprise Edition (J2EE), Tivoli Access Manager for On Demand Business helps you secure access to business-critical applications and data spread across the extended enterprise.

Web-based single sign-off (SSO) can span multiple sites or domains by exploiting Access Manager cross-domain SSO technology or by using Security Assurance Markup Language (SAML) and other token-passing protocols.

IBM Tivoli Federated Identity Manager

Although not generally available at the time of this writing, IBM has developed a new product that extends identity management capabilities beyond the enterprise in order to support the new Web SSO, cross-enterprise provisioning, and Web services security standards. IBM Tivoli Federated Identity Manager was announced for limited availability as a PRPQ in August 2004. More information about this product can be found in the IBM Redbook *Federated Identity Management with IBM Tivoli Security Solutions*, SG24-6394.

9.3 Federation for interoperable business identities

Federated identity is a technology for creating a globally interoperable online business identity for driving relationships or affinity driven business models between companies. The concept is nothing new, as we have real-world models for federated identities of individuals: a passport is a global identity credential that vouches for one's identity in a country; an ATM card is a credential that vouches for one's bank account; and a driver's license vouches for one's ability to operate a motor vehicle and is also frequently used as a proof of identity in many business transactions.

Federated identity management is the set of business agreements, technical agreements, and policy agreements that help companies to lower their overall identity management costs and improve user experience. It leverages the concept of a portable identity to simplify the administration of users in a federated business relationship. The simplification of the administration and the life cycle management of users in a federation leads to the following value proposition:

- ▶ Identity management costs can be lowered because companies are no longer in the business of managing users or identities that are not under their control. Businesses need to manage access to data but not have to manage accounts and user account data.
- ▶ User experience can be improved because users can navigate easily between Web sites while maintaining a global login identity.
- ▶ Integration can be simplified because there is a common way to network identities between companies or between applications. Organizations can implement business strategies that drive organic market and client growth by eliminating the friction caused by incompatible identity and security management between companies.

9.3.1 Federated Identity Management standards

Interoperability is essential if identity management and Web services are to succeed in cross-enterprise environments. Federations of trusted partners need the ability to communicate a wide variety of transactions, including provisioning, SSO, single sign-off (SSOff), deprovisioning, and purchasing in a secure manner. In order to achieve this level of interoperable security, a number of standards efforts have been introduced into the marketplace.

One of the first such efforts was by Microsoft with its Passport initiative. Passport was intended to serve as an SSO solution across Web sites on the Internet. This approach had the advantage of having the necessary client code embedded directly into the most commonly deployed desktop operating systems (Windows), giving Passport a considerable potential install base.

Passport was widely rejected, however, by security and privacy groups who pointed out problems that could arise from having a single broker of all trusted credentials. Few could agree on any single organization which would have the universal, world-wide appeal to serve as the keeper of the credentials for the global Internet.

Sun Microsystems™ led a counter movement called the Liberty Alliance that intended to quell Microsoft's efforts by using a more open, distributed approach. Instead of a central credential store controlled by a single organization, Liberty proposed a federated approach which spread such power among a variety of business partners.

Rather than getting caught up in the debate being waged in the trade press, IBM chose to work, instead, with some of the key players such as Microsoft and VeriSign to build a bridge that would span the chasm of competing interests with a far more inclusive, industry standards-based approach.

Figure 9-7 shows an overview of the federation standards in progress.

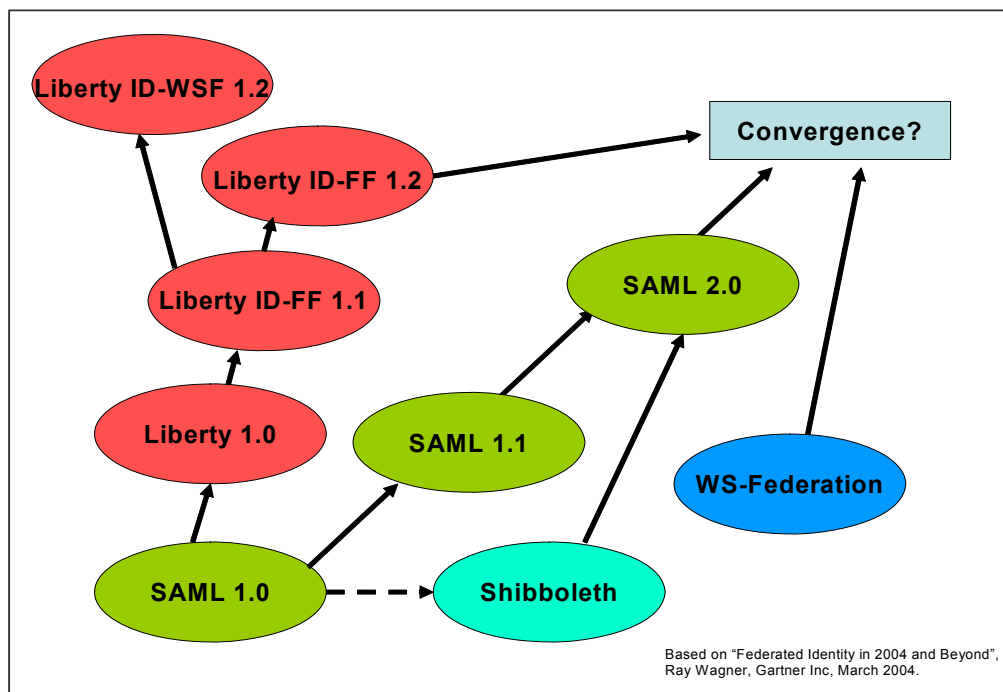


Figure 9-7 Overview of the federation standards in progress

Secure Socket Layer (SSL) / TLS

Secure Sockets Layer (SSL), standardized as Transport Layer Security (TLS), provides session-level security through the use of encryption. While not often thought of as an identity-management protocol, SSL can be used to authenticate senders and receivers through digital certificates, verify data integrity, and ensure confidentiality. As such, SSL is often the first and only option considered in securing transactions over the Internet. SSL can be used in both browser-to-Web server and server-to-server communications. Despite its popularity, SSL has some shortcomings in the following areas:

- Granularity

Either all the data over the session is encrypted or none is. This can impact throughput in cases where large amounts of data are exchanged, but only small portions of data actually need to be encrypted and decrypted.

- End-to-end

SSL protection ends if intermediate components need to examine transactions. No provision is made for encrypting end-to-end across intervening components.

Web Services Security (WSS) overcomes both of these shortcomings.

SAML

Security Assertions Markup Language (SAML) is a specification designed to provide cross-vendor SSO interoperability. SAML was developed by a consortium of vendors, including IBM, under the auspices of OASIS through the OASIS SSTC (Security Services Technical Council). SAML has two major components: SAML assertions and SAML protocols.

A SAML assertion is an XML-formatted token that is used to transfer user identity and attribute information from a user's interchange document profile (IdP) to trusted Service Providers (SPs) as part of the completion of an SSO request. SAML assertions are used to transfer information within an SSO protocol. A SAML assertion provides a vendor-neutral means of transferring information between federation partners. As such, SAML assertions have a lot of traction in the overall federation space.

SAML protocols are specified as bindings and profiles. SAML also defines protocols for implementing SSO. These protocols are HTTP-redirect-based and involve the user's browser. SAML defines two HTTP-based profiles for these SSO protocols:

- Browser/Artifact

With the Browser/Artifact profile, information is transferred both through HTTP redirection and through a direct, SOAP-over-HTTP back channel. With this profile, a SAML assertion is not transferred within the GET-based redirection flows. Instead, a SAML artifact is sent and used as a pointer to the SAML assertion. The assertion is then retrieved using a back-channel XML-over-HTTP request.

- Browser/POST

With the Browser/POST profile, the SAML assertion is included in an HTML form as part of the browser-based HTTP POST flows, thus providing a front channel means of transferring the SAML assertion.

Despite marketing claims by competitors to the contrary, SAML is not rich enough to support federations by itself. SAML does not address such issues as trust, user management, and privacy. SAML assertions are, however, rich enough to provide a *vouch-for* token for use within cross-domain SSO scenarios and across federation. SAML also can be leveraged within a larger WSS context to address federation requirements. In fact, the OASIS SSTC, together with the WSS effort, has defined a Web Services Security SAML Token Profile that

describes how to bind a SAML assertion in the context of WSS:SOAP Message Security for securing SOAP message exchanges.

Shibboleth

Shibboleth, a project of the Internet2/MACE initiative, is developing architectures, policy structures, practical technologies, and an open-source implementation to support inter-institutional sharing of Web resources subject to access controls. Shibboleth, which is based upon SAML, also introduces the notion of *Where are you from?* processing, allowing a service provider to implement both push and pull-based SSO protocols. In addition, Shibboleth will develop a policy framework that will allow interoperation within the higher education community, which is important because there are very strict rules on the release of information about an institution's students even to other higher-education institutions. IBM is a main member of the Shibboleth project. For more information, refer to:

<http://shibboleth.internet2.edu/>

Liberty Alliance Project

The Liberty Alliance Project is a consortium formed to deliver and support a federated network identity solution for the Internet that enables SSO for consumers and business users in an open, federated way.

The Liberty Identify Framework (ID-FF) describes federation functionality that goes beyond SSO. Liberty ID-FF profiles also include Single Logout (SLO), Register Name Identifier (RNI), Federation Termination Notification (FTN), and Identity Provider Introduction (IPI). The Liberty specified common user identifier (CUID) is referred to as a *NamelyIdentifier*. It is an opaque reference to an account that acts as an alias, meaning that it cannot be used to infer information about the user such as their identity. A Liberty *NamelyIdentifier* is used to establish and maintain the account linking between an IdP and an SP. The RNI profile allows a reset of a user's *NamelyIdentifier*, replacing a current value with a new identifier value. The FTN process removes all references to a *NamelyIdentifier*, achieving account delinking. Taken together, these profiles are intended to provide richer user management functionality within a federation, rather than a simple SSO.

The Liberty approach is based on business affiliates forming circles of trust. This term has two main, but different, uses. First, a circle of trust refers to a group of partners (both IdP and SP) that have a trust relationship. In general, this does not imply a pairwise trust relationship across all federation partners, but simply a pairwise trust relationship between all SPs and a given IdP. Within a circle of trust, a user is able to SSO from an IdP to any participating circle of trust SPs. The other definition of circle of trust refers to a common DNS alias that is shared by all circle of trust participants. This common DNS alias implements a form of "Where are you from?" functionality.

For more information about the Liberty approach, see:

<http://www.projectliberty.org>

9.4 Web services security

Web services have emerged as the most promising development to address cross-enterprise, cross-platform, and cross-vendor business integration issues. Web services is a family of emerging technologies that enable easy interoperability of programmed information technology (IT) services and integration of applications into a company's broader business processes. Web services technology enables companies to describe available services and provide access to those services over standard Web protocols and communications boundaries.

9.4.1 Business drivers

Web services security is required to allow businesses to exchange sensitive data in a secure and trusted manner. This includes secure communications across a multi-hop environment. Web services security removes the dependency on transport-level security that has been an artifact of Hypertext Transfer Protocol (HTTP) based communications.

9.4.2 Web services security specifications

In April of 2002, IBM and Microsoft published a Web services security roadmap. This roadmap describes a modular set of Web services specifications that allow clients to build secure Web services according to their individual needs. Several of these specifications have since been published and are described in this section. You can download the roadmap from the Web at:

<http://www-128.ibm.com/developerworks/library/ws-secmap/>

The Web services security roadmap (see Figure 9-8) defines and describes a set of specifications designed to provide a security standard foundation. This foundation is based on WS-Security, WS-Trust, WS-Security, and the WS-Policy and WS-Federation specifications. These specifications provide a high-level view of all the pieces needed for security in a Web services environment. In addition, these security specifications are factored into the rest of the Web services architecture. This allows clients to easily add other critical functionalities such as reliable messaging or transactions to a Web Service.

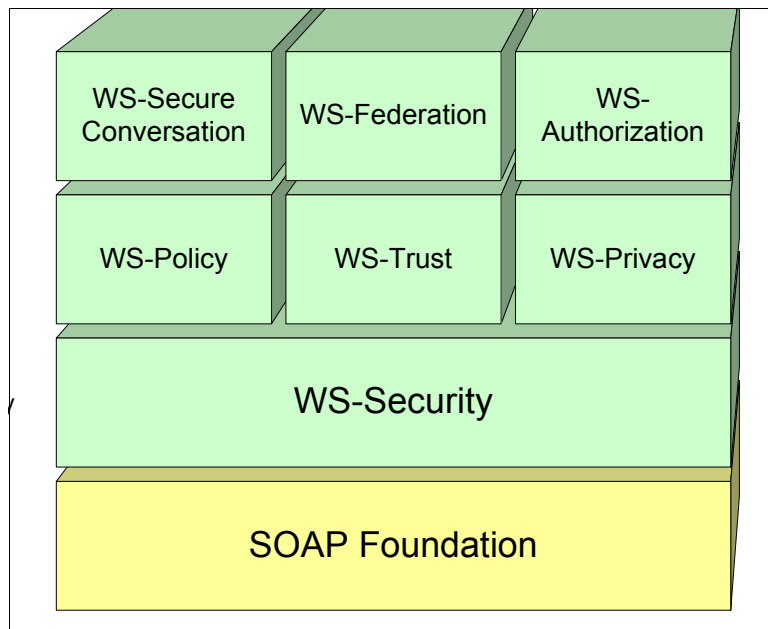


Figure 9-8 The Web services security roadmap

The components of this road map of specifications can be described briefly as follows:

- ▶ **WS-Security:** How to attach signature encryption headers to SOAP messages. In addition, it describes how to attach security tokens, including binary security tokens such as X.509 certificates and Kerberos tickets (an encryption system developed at MIT), to messages.
- ▶ **WS-Policy:** The capabilities and constraints of security and other business policies on intermediaries and endpoints (for example, required security tokens, supported encryption algorithms, and privacy rules).

- ▶ WS-Trust: A framework for trust models that enables Web services to securely interoperate.
- ▶ WS-Privacy: A model for how Web services and requesters state subject privacy preferences and organizational privacy practice statements.
- ▶ WS-Secure Conversation: How to manage and authenticate message exchanges between parties, including security context exchange and establishing and deriving session keys.
- ▶ WS-Federation: How to manage and broker the trust relationships in a heterogeneous, federated environment, including support for federated identities.
- ▶ WS-Authorization: How to manage authorization data and authorization policies.

For more details, see:

<http://www.ibm.com/developerworks/library/ws-secmap/>

9.4.3 WS-Federation

Of particular note among the Web Services Security road map specifications is WS-Federation. The interoperability of this specification between IBM and Microsoft has been demonstrated several times, including by Bill Gates and Steve Mills in New York City in September of 2003. Subsequent to that, a public interoperability exercise was held on March 29-30, 2004 between IBM, Microsoft, and other third-party vendors.

WS-Federation describes how to use the existing Web services security building blocks to provide federation functionality that includes trust, SSO, and SSO_{off}, as well as attribute management across a federation. WS-Federation is really a family of three specifications: WS-Federation (WS-FED), WS-Federation Passive Client (WS-FEDPASS), and WS-Federation Active Client (WS-FEDACT).

WS-Federation Active Client describes how to implement federation functionality in the active client environment. Active clients are those that are Web services-enabled, able to issue Web services requests, and react to a Web services response. Leveraging the Web services security stack, WS-Federation Active describes how to implement the advantages of a federation relationship, including SSO, in an active client environment.

WS-Federation Passive describes how to implement federation functionality in a passive client environment. A passive client is one that is not Web services enabled. The most commonly encountered example of a passive client is an HTTP browser. WS-Federation Passive describes how to leverage the advantages of a federation relationship, such as single signoff, in a passive client environment. Because this solution leverages the WS-Security foundation of the infrastructure support, the same components used to provide a passive client solution may be leveraged for an active client solution. The three specifications that make up WS-Federation are available for download from IBM developerWorks® at the following sites:

- ▶ WS-FED
<http://www-106.ibm.com/developerworks/webservices/library/ws-fed/>
- ▶ WS-FEDACT
<http://www-106.ibm.com/developerworks/webservices/library/ws-fedact/>
- ▶ WS-FEDPASS
<http://www-106.ibm.com/developerworks/webservices/library/ws-fedpass/>

9.4.4 Web Services Security Architecture

Web Services Security (WSS) Architecture provides a flexible mechanism for secure process-to-process communications, such as those used in complex, extended enterprise applications. It provides a basis for building secure, interoperable solutions on heterogeneous systems across enterprises using standards-based Web services, as well as device independence by isolating security mechanisms from function security and business logic.

Web services applications communicate using SOAP messages, which are defined in XML. These messages are most often transported over HTTP, but in principle can be carried over any underlying protocol. WSS provides a framework for encrypting, signing, and authenticating SOAP messages. A high level depiction is shown in Figure 9-9.

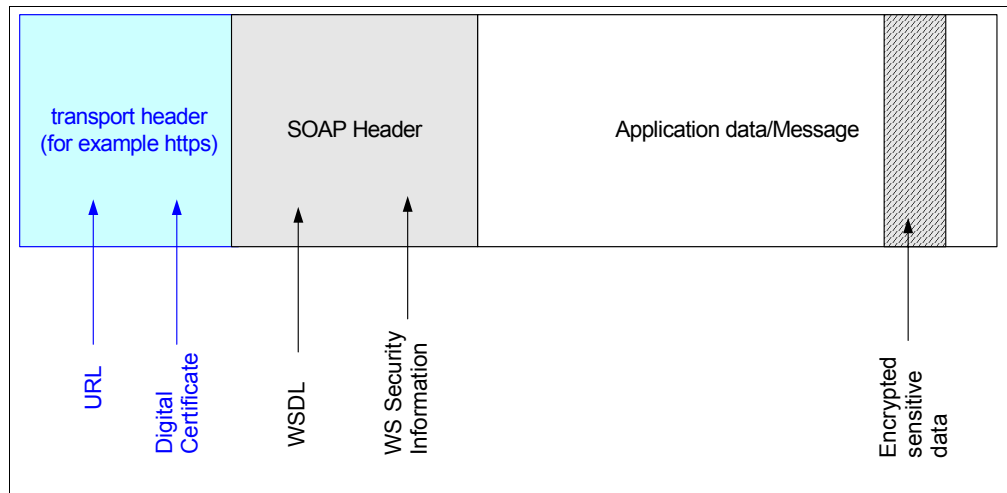


Figure 9-9 How Web services applications communicate

WSS defines XML elements that can be used to provide confidentiality, integrity, and authentication. It does this by using other specifications while adding some key elements of its own. For example, WSS implements digital signatures and encryption by referencing the XML digital signature and XML encryption recommendations developed by the World Wide Web Consortium (W3C).

A security element for each node that receives the message appears in the SOAP header. The information in this element lets a sender tell a receiver what data has been signed, what has been encrypted, the order in which to perform the operations, and what keys to use. WSS also lets senders specify the creation and expiration date and time of security information.

WSS does not specify a particular set of message exchanges and cryptographic operations the way Kerberos or SSL/TLS does. It is expected that other specifications will describe detailed usage patterns and even add elements to implement and optimize complex capabilities.

WSS can be used directly to meet simple needs, such as signing or encrypting portions of a single message, as shown in Figure 9-10 on page 145.

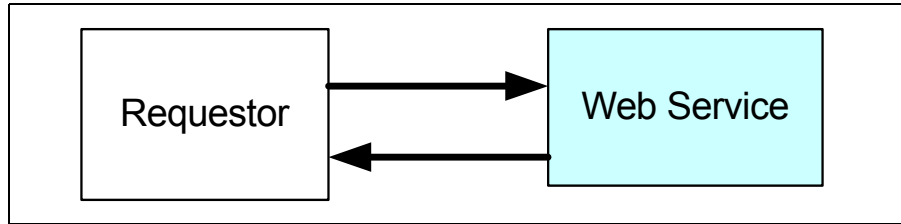


Figure 9-10 Using WSS directly to meet simple needs

Alternative mechanisms such as SSL/TLS can be used to protect Web services messages. For many applications, they might prove satisfactory, but there could be limitations. For example, even in this simple scenario, use of SSL could result in a security exposure on redirection, such as that encountered on proxies, because data may be decrypted by the proxy before reaching the Web service provider.

WSS extends the security provided by such traditional transport level security mechanisms. It allows for signing and encrypting of sensitive parts of a message so that only the endpoint may decrypt it and verify its integrity, as shown in Figure 9-11.

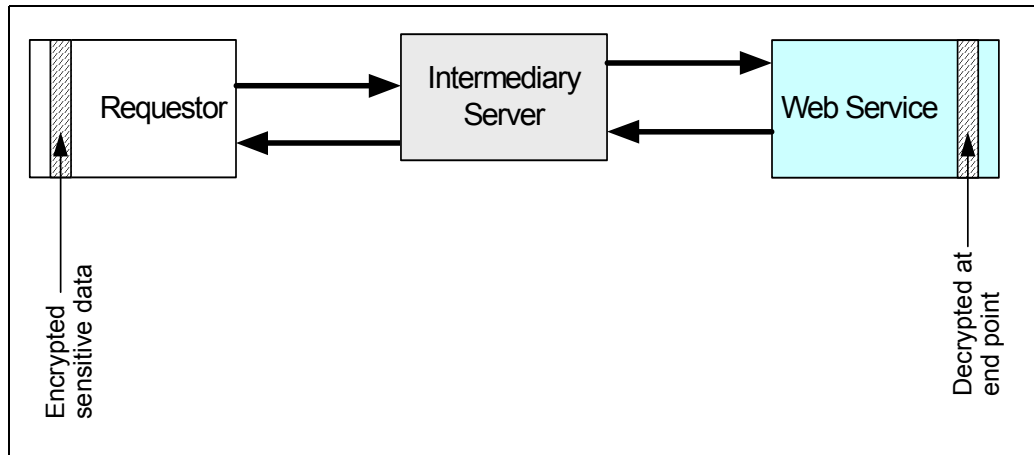


Figure 9-11 WSS signing and encrypting of sensitive parts of a message

It is possible for a message to be signed at one node, additional data to be added and signed by a second node, and finally verified by the receiver. An intermediate node can process portions of the message, even though other portions have been encrypted. As Web transactions become more complex, and intermediaries of varying levels of trust become involved, the need for selective encryption and signing becomes more important both for security and performance reasons.

For example, if only one KB of a 50 MB message needs to be encrypted, SSL session-layer security has no means to economize, as all traffic over the session is equal and, therefore, all incur the overhead necessary to do the encryption. WSS provides better granularity by encrypting only those parts of the message that need that level of protection, thereby reducing overhead substantially. However, these savings might not be realized if a large number of messages are exchanged, because a new public key operation must be performed for each message. With SSL, a single public key operation is done at setup and a session key is used. At the time of this writing, WebSphere Application Server does not yet support the sort of element-level encryption described here, but plans call for this to be included in the 6.0 release.

Because Web services will be used in many environments, WSS makes it possible to use various systems to distribute keys and other authentication information, such as security tokens, X.509 certificates, and Kerberos tickets, which are carried in binary tokens, while SAML assertions and extensible rights markup language (XrML) licenses are represented as XML tokens. WSS also defines a user-name token, which might be used in conjunction with a password.

WSS specifications allow for access to a token service, allowing additional flexibility in the types of tokens that can be used in a Web services interaction. Depending upon the level of trust, WSS also allows for a validation service to be used by the Web Service provider. These types of access are shown in Figure 9-12.

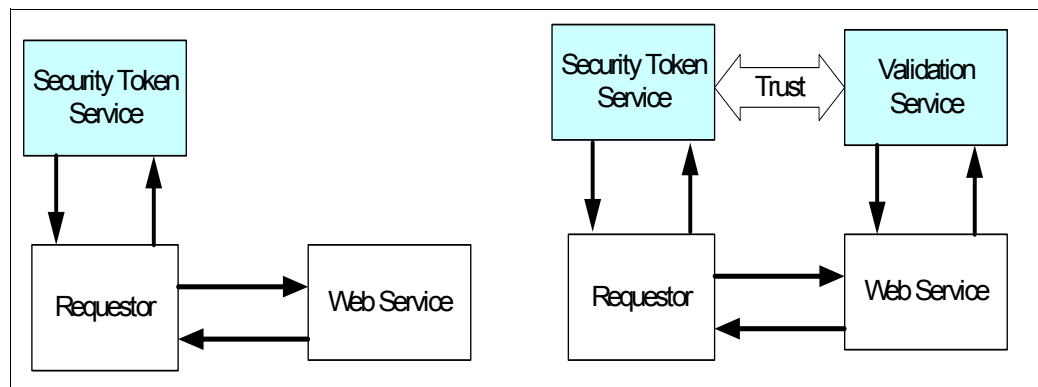


Figure 9-12 WSS access to token service

WSS specifications also allow for federation of identities, as shown in Figure 9-13.

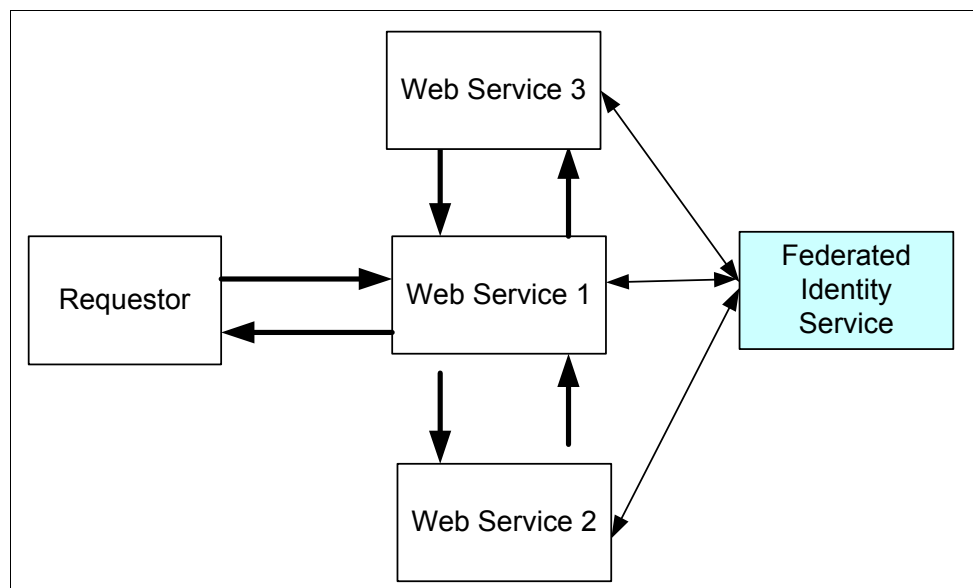


Figure 9-13 WSS allows for federation of identities



IBM techniques for On Demand Business

This chapter describes the following techniques for designing and implementing On Demand Business solutions:

- ▶ Component Business Model (CBM)
- ▶ Component Infrastructure Roadmap (CIR)
- ▶ CBM for the Business of IT (CMB-BoIT)
- ▶ Service-oriented Modeling and Architecture (SOMA)

10.1 IBM techniques for On Demand Business

Clients need to understand where they are today, and where they want to go, on their On Demand Business journey. To this end, IBM has developed a family of On Demand Business Component Techniques that accelerate the client's journey to becoming an On Demand Business. The techniques are based on a combination of frameworks and methodologies to help companies better align their IT infrastructure with their core business activities and objectives.

Table 10-1 shows the client issues/needs for becoming an On Demand Businesses and the IBM Techniques that can be applied.

Table 10-1 IBM Techniques for On Demand Business

Client issue/need	Technique applied
Business process and organization, a business design that enables the organization to achieve growth and competitive advantage.	Component Business Model (CBM)
Identify and fill gaps in IT infrastructure to achieve operational efficiency, flexibility, and resiliency.	Component Infrastructure Roadmap (CIR)
IT Management (CIO).	CBM for the Business of IT (CBM-BoIT)
A service-oriented architecture (SOA) to achieve business flexibility.	Service-Oriented Modeling and Architecture (SOMA)

10.1.1 Component Business Model

The idea of viewing a business as a set of interlocking components, and the underlying notions of specialization and reusability, is not exactly new. Businesses have always understood that to be as efficient, effective, and profitable as possible (to maintain their competitive edge) they have to create exceedingly responsive and flexible organizations comprised of components with discrete services.

Yet traditional business modeling, based on mapping individual business processes, does not incorporate this idea. So until now, building flexible organizations has been a challenge. But changing business practices are enabling flexibility: new collaborative relationships with clients, suppliers, and competitors, and outsourcing of processes and functions. And changes in technology (global connectivity provided by the Net, the spread of open standards, and the emergence of Web services, grid, and others) are allowing businesses to structure themselves and provide a breadth and scale of services in ways that would have been difficult or impossible before. As business and technology evolve to enable these more flexible organizations, the need has arisen for the matching evolution of techniques with which to view them.

IBM has met that need, and simplified the mechanism so that it is easier for clients to understand. Where process-based modeling can produce hundreds of documents that map individual processes, component-based modeling yields a single-page model that can be used to illustrate strategic, financial, or transformational ideas across a company's operations.

Component Business Model is an innovative and powerful analytical tool to help the client address their critical business and technology issues.

Business components provide the capability to easily view the enterprise through a number of different "lenses," simply by changing the criteria by which components are evaluated, for example, financial, strategic fit, organizational, and technical. It enables IBM to deliver on the

“full equation”: bringing together our research, services, and technology capabilities around client issues to create substantial and sustainable value in a single integrated framework.

CBM allows organizations to be seen as autonomous, manageable components. This helps decision makers to “disentangle” the organization, cutting through historical boundaries arising along organizational, product, channel, geography, and application lines. The new clarity is the basis for better decision-making.

Each component is a grouping of the people, technology, and resources delivering specific business value and potentially able to operate independently; in the extreme, as a separate company, or part of another company. Components have well-defined interfaces, allowing them to interact smoothly with each other and to be 'snapped' in and out at will, like building blocks.

Figure 10-1 shows the Component Business Model Technique with an Auto Industry example (As part of a CBM engagement, IBM helps clients deconstruct the core components of existing business processes, and then determine which provide the most strategic differentiation.)

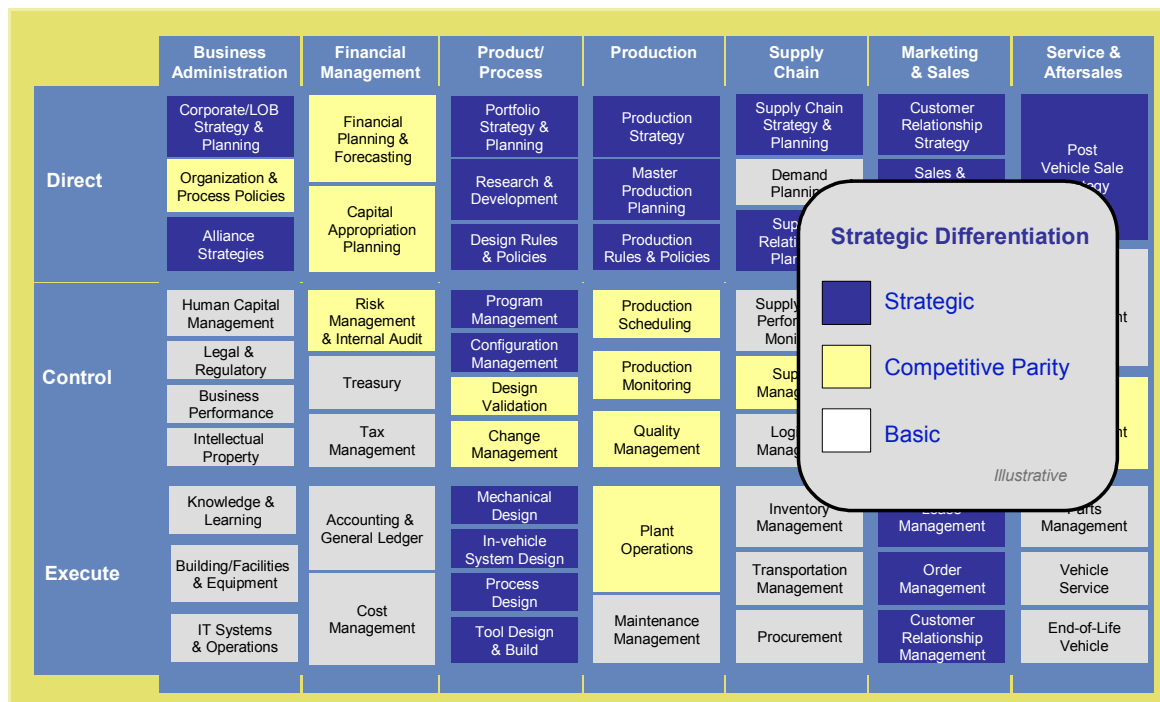


Figure 10-1 The Component Business Model technique with an auto industry example

Using the CBM, an enterprise can be viewed as a collection of components coming together to create business value. An analogy is in chemistry, where atoms combine and recombine to form different molecules, doing different things. The CBM is an end-to-end way of looking at the business through all the layers: not just the business layer, but the application layer and IT infrastructure too. The combination of the views of all the layers is the foundation for sensible recommendations concerning the enterprise. By linking the CBM with service-oriented architectures (SOA), we can also address the underlying IT infrastructure.

After building the component map, we can identify improvement opportunities by choosing and applying evaluation criteria such as cost, revenue potential of a given market opportunity, strategic fit, alignment between business and applications, and many others. This is done by

asking diagnostic questions for all relevant components. Applying these criteria produces a 'Heat Map,' which shows where opportunities exist.

CBM is valuable for industries and enterprises that are desegregating and need analytic tools and insights to help them. CBM affords a clear focus on the strategic capabilities of the business. Further, we find that business components and the supporting solutions are increasingly reusable across products or business lines, increasing the efficiency and effectiveness of an organization. The CBM is also of value to clients in analyzing their application portfolio and transforming legacy applications.

CBM addresses all aspects of an On Demand Business from business strategy to the applications analysis, and offers a comprehensive method to introduce the On Demand Operating Environment to the clients. It helps to demonstrate deep client and market insight and facilitates a structured approach to institute the client's strategy.

10.1.2 Component Infrastructure Roadmap

Component Infrastructure Roadmap (CIR) (previously ODAM) helps clients identify how they can make their journey from an IT perspective. It assists in prioritizing the IT spending based on strategic objectives and IT projects that yield the maximum impact by helping the clients to know where they are now and how to get started implementing an IT strategy that aligns with their business objectives.

CIR is a technique that facilitates the On Demand Business transformation of a client's IT infrastructure linked to their business goals. It delivers a customized roadmap that identifies the specific projects needed to move an individual client's IT infrastructure from its current state to a desired future state.

CIR helps clients in many ways:

- ▶ Facilitates long-term planning for On Demand Business transformation
- ▶ Links IT transformation to business requirements
- ▶ Allows you to capitalize on IBM's expertise

The CIR technique identifies current states and desired target states based on business goals. Incremental roadmaps are developed to achieve these states.

Figure 10-2 on page 151 shows how CIR plots a client's current state against their desired state.

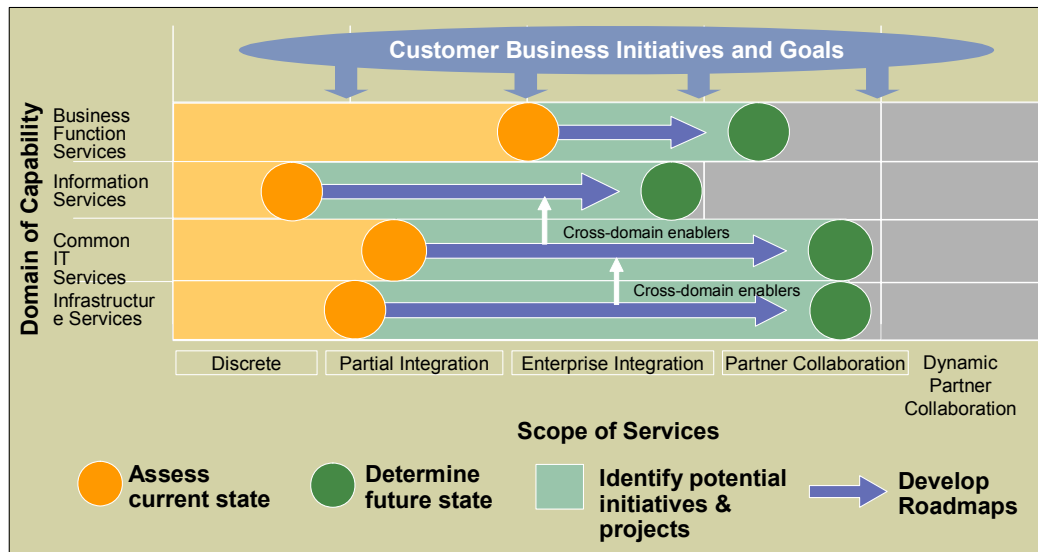


Figure 10-2 How CIR plots a client's current state against their desired state

The Y-axis focuses on Domains of Capability derived from IBM On Demand Operating Environment Architecture. Table 10-2 describes the CIR Domains of Capability.

Table 10-2 CIR Domains of Capability

Domain	Description
Business Function Services	Provides the application frameworks to enhance the execution of Business Service through software engineering. Maturing to On Demand Business will accelerate the delivery of new services through the use of consistent, repeatable service-oriented architectures.
Information Services	Provides a common, repeatable method for cataloguing, accessing, and managing the firm's information. On Demand Business streamlines information access and data management, making it easier to integrate packages and new acquisitions.
Common IT Services	Creates Enterprise pools of commonly used infrastructure functions and application services. Simplifying the environment in this manner enhances management and cost, but also makes the environment more responsive, enabling On Demand Business Operations.
Infrastructure Services	Provides pools of processing and networking resources for applications and business functions. Today, these resources may be isolated into business silos, but with On Demand Business, they will evolve into virtual pools that are dynamically allocated based on business need.

Table 10-3 on page 152 describes the CIR Scopes of Services.

Table 10-3 CIR Scopes of Services

Scope of Services	Description
Discrete	Dedicated to a particular LOB or application (silo, geographic, or location oriented)
Partial Integration	Connected (linked) but not fully integrated across the entire enterprise
Enterprise Integration	Horizontal and vertical integration and optimization across the entire enterprise where there is business value
Partner Collaboration	Sharing and integration with known partners
Dynamic Partner Collaboration	Sharing and integration with unknown / indeterminate partners

From a catalogue of capabilities and projects, we identify those that will move the client to their desired state. Then we develop a roadmap that prioritizes these projects and creates a step-by-step process and timeline for getting from A to B.

Generally, clients advance further in the lower domains such as infrastructure services and common IT services. First, create a componentized view of the IT Infrastructure and plot the current state. Next, decide what is the desired business and IT outcome. Plot a path of IT initiatives that moves the organization towards the outcome. Finally, prioritize the IT transformation initiatives. Pick projects that provide quick return (for example, server consolidation).

The output of using the CIR is a technical roadmap that considers all facets of the On Demand Operating Environment and recommends the implementation of capabilities and technologies appropriate to that specific client. The roadmap is positioned in the context of business initiatives, correlates activities across technology domains, and recommends sequencing of projects based on prerequisite capabilities. There are a variety of sourcing alternatives to deploy the recommended projects and initiatives from the output of a CIR.

10.1.3 Component Business Model for the Business of IT

A component business model is a logical representation, or map, of a business that reveals its essential building blocks. It is a technique for modeling an enterprise into non-overlapping and unique components. Each component is a logical grouping of the people, technology, and resources that deliver specific business value, and could potentially operate independently. CBMs have been created for most of the industry, and are being utilized in a variety of ways.

CBM-BolT provides framework for running the “business of IT”. Components provide high level definitions of the activities and resources necessary to define and operate an IT services environment supporting an On Demand Business. The components provide the IT services to the business. CBM-BolT can help identify optimization and transformation benefits and support IT leadership decisions.

Figure 10-3 on page 153 shows the CBM-BolT Technique. In the figure:

- ▶ Each of the seven columns represents a key competency in IT service provision with similar skills and capabilities.
- ▶ The components (and activities) within each of the seven competencies are subordinate to three basic types of activities: Plan and Manage, Build, and Run.

- Each of the three levels represent a different level of accountability:
 - Directing is about strategy, overall direction, and policy.
 - Controlling is about monitoring, managing exceptions, and tactical decision making.
 - Executing is about doing the work.
- Each of the seven competencies break down into components that consist of unique activities, resource requirements, and so on.

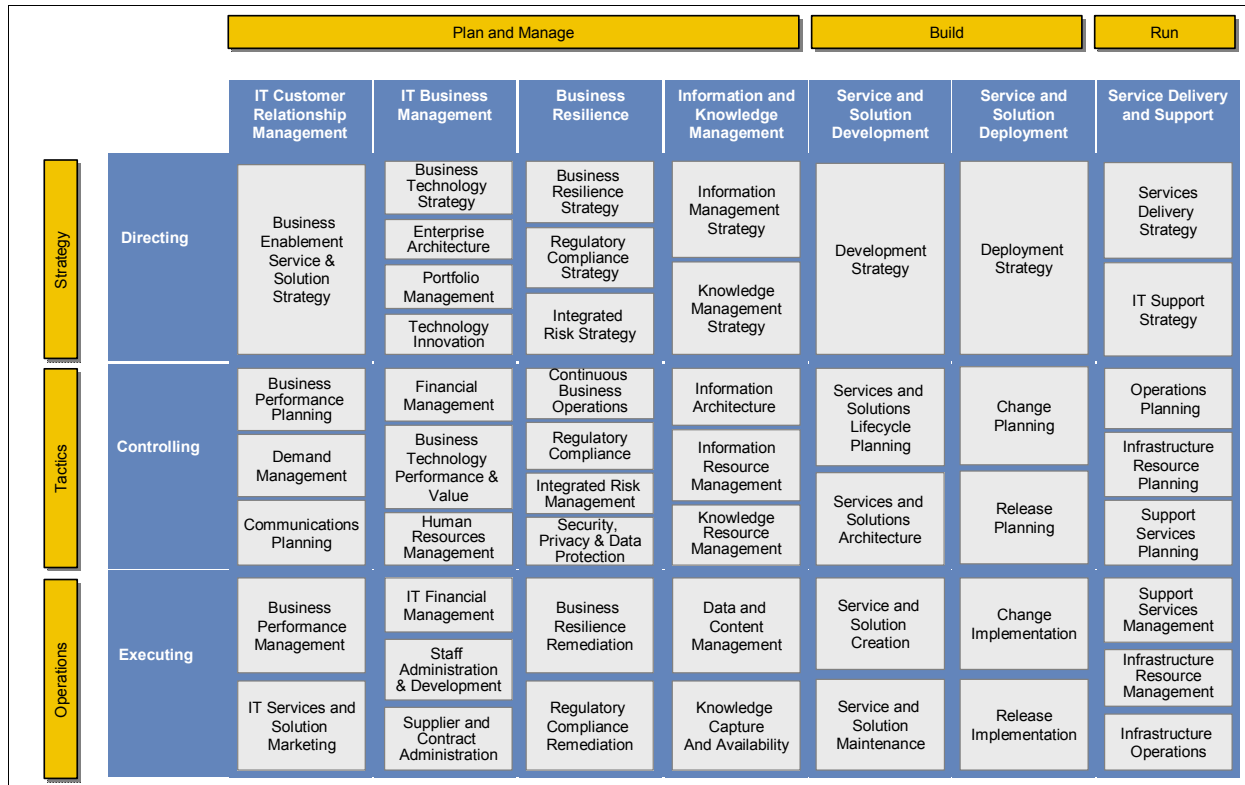


Figure 10-3 The CBM-BoIT technique.

Table 10-4 shows the seven CBM-BoIT competencies and their description.

Table 10-4 CBM-BoIT Competencies

Competency	Description
IT Client Relationship	Serves as the primary client (consumer of IT services) interface. At the strategic level, it determines the markets (internal or external) for IT services, and client wants and needs within those markets. At the controlling level, it serves as the ‘translator’ between business and technical domains. At the execution level, the competency provides the marketing interface between the individual clients and IT services, and serves as the client advocate to the IT function.

Competency	Description
IT Business Management	Comprised of a set of components responsible for defining and maintaining the relevance of IT to the business, understanding and communicating the role of IT within the enterprise, establishing the enterprise architecture and guiding principles, defining the IT management system and governance model, and for managing the business activities that help ensure attainment of IT value.
Business Resiliency	Interprets the enterprise need for resilience and regulatory compliance, develops strategies to meet those needs, ensures the realization of those strategies within the infrastructure, and manages their execution over time.
Information and Knowledge Management	Responsible for a key enterprise asset: information, and knowledge management for the IT function as a model for the remainder of the enterprise. IT's role is no longer simple data capture and maintenance. Because of its position within the enterprise, IT is in a position to help recognize the value of information integration across the enterprise, creating new value from existing assets.
Service and Solution Development	Governs IT development activities throughout the enterprise. Those development activities could result in a new service, a new solution, or a combination of solutions and services to enable and facilitate business processes (including IT management activities). Service and solution life cycle planning along with maintenance are also considered to be part of the development process.
Service and Solution Deployment	Responsible for timely introduction of change into the production environment with the minimal amount of disruption to business operations, while remaining within the organization's risk tolerance.
Service Delivery and Support	Responsible for operations, maintenance, and support of the production environment in the most cost efficient manner while meeting all service level objectives.

The CBM-BoIT map was created from the perspective of the role within an enterprise having overall responsibility for the investment and use of information technology. Typically, this role is referred to as Chief Information Officer (CIO) or Chief Technology Officer (CTO). This perspective is important in that it establishes the scope of components and activities defined within the map. The map was designed to be 'stand alone', meaning that it could be applied to a company whose sole business was IT services. When applied within a different context, there may be extraneous or duplicate components that can be eliminated.

The map is technologically agnostic, meaning that it does not assume any specific type of hardware or software. Rather, it takes the perspective that the IT function can be defined in a similar manner to any other component of the enterprise, and should be managed using the

same business disciplines. Definitions of specific architectures or technologies must be done within context, and will affect a number of components accordingly.

The primary purpose of the IT component is to provide technology enabled business services. These technology enabled services can be in support of the internal activities of other business components (including business activities within the IT function), or they can be externalized to consumers, such as Web sites.

The relationship among the IT component, other business components, and the actual technology is illustrated in Figure 10-4.

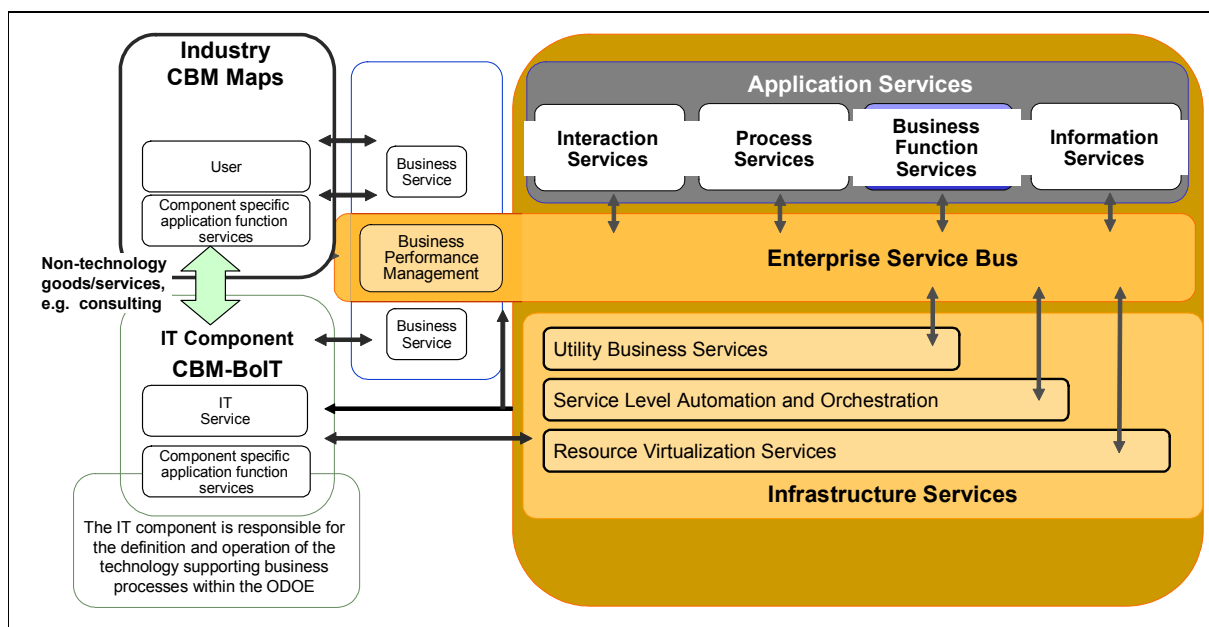


Figure 10-4 CBM-BoIT component relationships

As is illustrated by the large, double-ended arrow, not all business services are IT enabled, even those provided by the IT component. There are non-technology enabled services, such as deskside support provided by the IT component. The IT component also utilizes services from other business components, such as building services that are not IT enabled, shown as the bi-directional arrow between the IT component and the business service box. The IT component does, however, have access to the enterprise service bus, a mechanism to facilitate the flow of IT enabled business service information. The IT component, like the rest of the components, can use this bus to both supply and access IT enabled business services. However, as illustrated in Figure 10-4, the primary function of the IT component is the definition and operation of the technology supporting the business components. The IT component may not physically own all the parts of the IT infrastructure, but the IT component within the larger enterprise is responsible for ensuring that the suppliers of those services meet all their commitments.

CBM-BoIT is about running the business of IT in an On Demand Business manner. CIR provides the initiatives to get to an on demand state by looking at the "hot spots" created during the CBM-BoIT effort, and identifies the initiatives and projects needed to increase that area's maturity. Complementary in nature, CBM-BoIT is much broader, and focused on the organizational structure, processes, activities, and resources needed to run the business of IT, while CIR is focused on the solutions, services, products, and technologies needed to move to an on demand business.

10.1.4 Services Oriented Modeling and Architecture (SOMA)

SOMA is a business inspired technical transformational approach aimed at implementing the target business processes on the foundation of a service-oriented architecture. It creates continuity between the business intent and IT implementation by extending business characteristics (goals, key performance indicators, and objects of performance monitoring) into the IT analysis and decisions.

SOA is essential to how we want to be operating. Services are the building blocks that represent the business functions. The need is to reuse these services as much as possible. Services are used to get the right information, wherever it is, in whatever database, in whatever back-end system, to the right people at the right time. Services can be computer applications talking to computer applications, or they could be the applications that sit behind portals, for example, to deliver information in a combined manner.

In context of:

- ▶ Business, SOA is a set of services that a business wants to expose to their clients and partners or other portions of the organization.
- ▶ Architecture, SOA is an architectural style that requires a service provider, requestor, and a service description. Also, it is a set of architectural principles, patterns, and criteria that address such characteristics as modularity, encapsulation, loose coupling, separation of concerns, reuse, composability, and single implementation.
- ▶ Implementation, SOA is a programming model complete with standards, tools, and technologies, such as Web Services.

SOMA is focused on the first two aspects.

SOMA may be considered as a bridge between CBM and the SOA-based On Demand Operating Environment.

The SOMA method can serve as an adjunct to CBM (or other business modeling approaches), taking the key business processes and models identified and prioritized by a CBM engagement and aligning them with the underlying applications and infrastructure needed to implement those processes.

The SOMA bridge can also work in the reverse direction, moving from an ODOE-centric CIR engagement toward the improvement and automation of business processes. For instance, SOMA can help map legacy systems and services to critical business processes and into SOA environments.

Figure 10-5 on page 157 shows IBM's SOMA framework and method that serves to bridge the business process world with the underlying, SOA infrastructure that supports those processes.

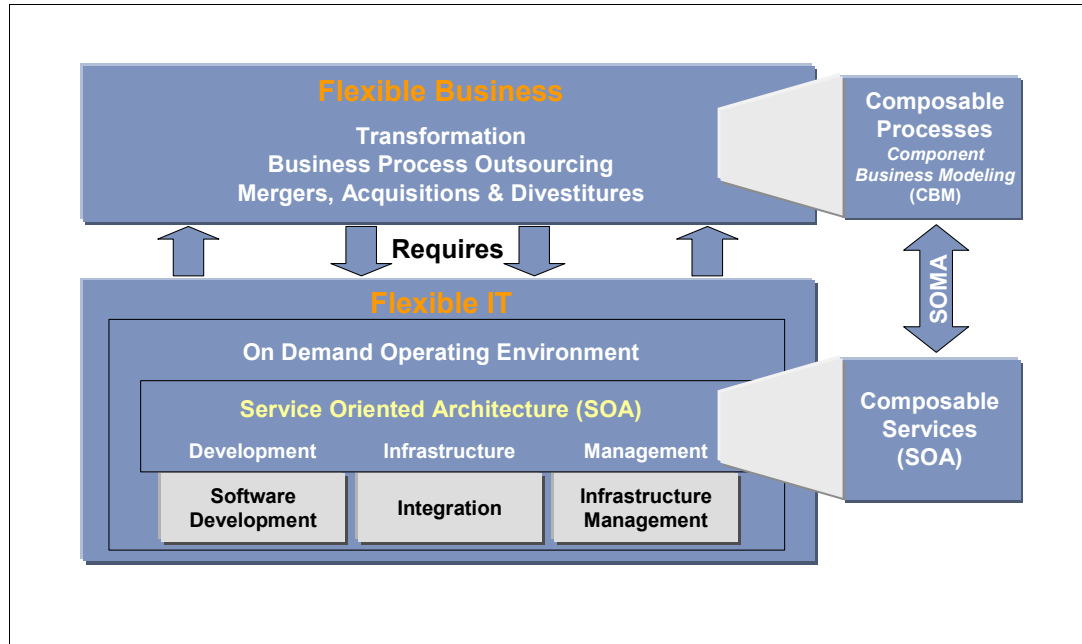


Figure 10-5 IBM SOMA framework and method

The identification and specification of services is at the heart of SOMA, which aims to help companies direct their IT resources quickly and efficiently to preferred projects. The output of a SOMA engagement is a services model that defines the most appropriate SOA design for supporting the company's core business processes.

SOMA makes use of and extends a variety of well-established software engineering techniques to map business processes into a SOA environment. These techniques include domain analysis, process modeling, component-based development, and object-oriented analysis and design. SOMA also introduces some techniques of its own to address the specific demands of generating a services model.

IBM thinks of SOMA as something of a fractal model, wherein the SOMA techniques can be applied on a small scale to specific line-of-business processes, more broadly to processes that span an enterprise, or even to processes that span ecosystems of partners, clients, and suppliers.

In practice, there are three primary SOMA activities conducted to model individual services and their relationships to other services, and then to instantiate them via a SOA deployment. As shown in Figure 10-6 on page 158, these activities or stages are:

1. Identification of services and components
2. Specification of service characteristics
3. Realization of the services

The three major steps of SOMA activities

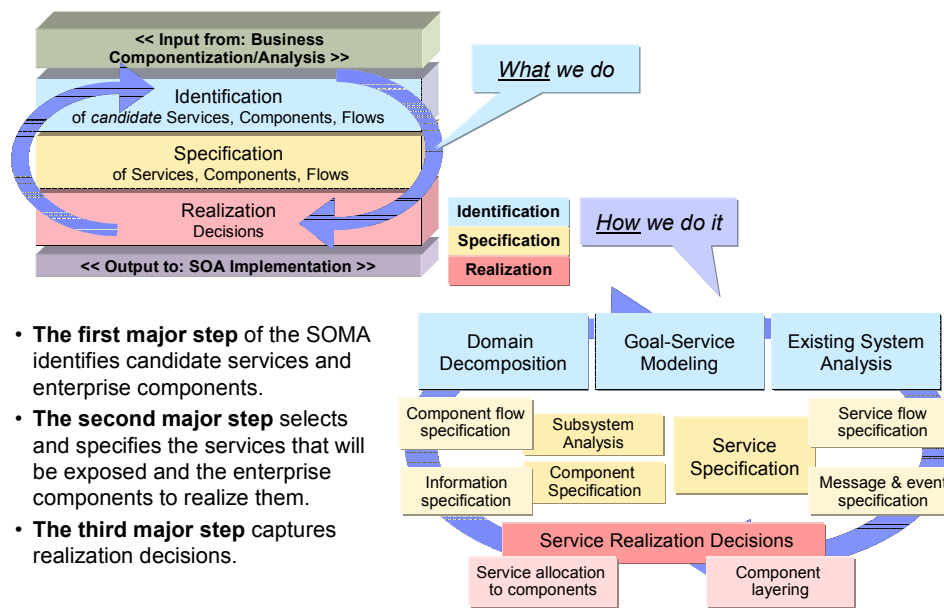


Figure 10-6 Primary SOMA activities

Although it is easiest to describe these three activities sequentially, in practice, elements of them may all occur in parallel.

In the first stage of a SOMA engagement, identification, candidate services and enterprise components are identified. Some of these services may already exist, others may need to be created. SOMA uses three approaches to identify such services candidates:

1. Domain decomposition, which is a top-down analysis of business domains and processes, and which flows naturally from a CBM engagement.
2. Goal Services Modeling (GSM), a new approach IBM has developed to complement domain composition that helps align services with business goals and also helps determine the appropriate coarseness of a service.
3. Existing system analysis, a bottom-up approach (which could include a CIR engagement) that looks at current IT assets including legacy systems and applications, and determines which can be most beneficially wrapped and presented as standards-based services.

In the second stage of the SOMA process, specification, the characteristics of services are specified in a services model. Clients can use this model, which defines the composition of services, their dependencies, their interfaces, and other characteristics, to help determine which of the services to keep internal, and which to expose to external users, such as clients or suppliers.

The final stage of SOMA, realization, involves making architectural decisions about how to implement the targeted services. SOMA provides a framework for making these decisions and assessing in advance the likely performance and impact of services once deployed in the SOA that the process has helped define. In this manner, SOMA service can greatly reduce the risks and uncertainties associated with moving successfully from tightly coupled, legacy IT environments to more flexible, business-centric SOA environments.

Bridging the business activities and processes with the IT infrastructure, SOMA will better align the business and IT realms. In focusing on ways to build this linkage, however, it is important not to lose sight of the fact that the IT infrastructure itself is a necessary and critical player. This infrastructure is represented by On Demand Operating Environment, constructed out of IBM's portfolio of middleware platforms and products.

On Demand Business solutions and examples

Whereas Part 2 of this redbook contains reference and conceptual information regarding On Demand Business solution design, this part contains “guide and how to” information for designing On Demand Business solutions, including solution examples.

It contains the following two chapters:

- ▶ Chapter 11, “On Demand Business solutions” on page 163
- ▶ Chapter 12, “On Demand Business solution examples” on page 227



On Demand Business solutions

This chapter describes On Demand Business solutions. It contains the following subcategories:

- ▶ IBM On Demand Business and top client priorities
- ▶ IBM On Demand Business solutions offerings portfolio structure
- ▶ Architectural considerations for On Demand Business solutions
- ▶ Business solutions
- ▶ Infrastructure solutions
- ▶ How to implement an On Demand Operating Environment
- ▶ Virtualization engine as a solution building block/standardized bundle

11.1 IBM On Demand Business and top client priorities

IBM conducts worldwide research to pinpoint the top client priorities, across large and mid-size organizations in key industries worldwide.

Business leaders are demanding more from their organizations and looking for new ways to achieve growth and productivity, and an optimized technology environment aligned to their business goals. IBM has identified priorities that are a priority for executives, the ones in which they plan to invest time, energy, and resources now.

The top client priorities sit within two broad groupings:

- Growth through innovation

Eight out of 10 CEOs are concerned with finding ways to grow while containing costs. Clients are looking for ways to innovate in their business to fuel this growth, investing heavily to differentiate and capture new value, to transform their entire business to operate in the on demand world. Solutions to address business processes and industry issues are often Business Solutions.

- Productivity and IT optimization

Clients are striving for ways to increase productivity beyond traditional approaches. They need to address increasingly tight margins, enhance productivity, and achieve resource and cost-structure efficiencies. They are also investing in simplifying their IT environments, managing risk across their organizations, and aligning IT with overall business goals. These kinds of infrastructure problems and issues are often addressed by Infrastructure Solutions.

Table 11-1 shows the priority areas for each of these two groups of priorities.

Table 11-1 Top client priorities and areas of priorities

Priority	Area
Getting growth in new ways	Improving the client experience
	Integrating the supply chain
	Driving product differentiation
	Driving organizational change and employee productivity
Driving productivity and optimizing IT	Increasing business flexibility
	Leveraging information insights
	Simplifying/optimizing the IT environment
	Enhancing business resilience, security, and compliance

11.2 IBM On Demand Business solutions offerings portfolio structure

IBM has developed an On Demand Business solution offerings portfolio structure. The most suitable solution can be offered, no matter the simplicity or complexity of the client's need.

The range of options available include individual products or services, pre-configured bundles (building blocks if you will) (almost like sub-assemblies), infrastructure solutions, primarily

focused on the IT infrastructure (some are varying combinations of products and services that work together to solve a specific scenario; some are more tightly integrated, having undergone careful component selection with services and additional integration testing as a whole), and business consulting (service-driven solutions that can help the clients solve challenging business problems).

From the ground up, Table 11-2 shows the IBM On Demand Business solutions offerings portfolio structure.

Table 11-2 IBM On Demand Business solutions offerings portfolio structure

Solution	Description
Business Solutions	Services that drive the right technology solution to help solve an entire business process problem for your client. These are highly customizable to the individual client, but made up of multiple predefined elements and are designed to enable business transformation.
Infrastructure Solutions	Service- and assessment-led technology solutions to solve an IT problem. Also customizable and comprised of multiple predefined elements, these solutions focus on infrastructure-wide improvements.
Solution Building Blocks	Preconfigured bundles that enable larger business or infrastructure solutions, but require additional integration (not included).
Standardized Bundles	Offerings of products and services packaged as standardized bundles that solve an immediate need without seeking to transform client business.
Individual Products and Services	Single-brand products or service transactions that are not part of other offerings.

11.3 Architectural considerations for On Demand Business solutions

The basic premise of the whole “solution” thrust is that both the Business Solutions and Infrastructure Solutions view our portfolio of “stuff” from the viewpoint of the client's business problem, in other words, “top down.”

Business Solutions are aimed at solving a business problem that is particular to an industry, or that has to do with enabling a business process such as sales, commerce, supply chain management, and so on. These problems are often solved by industry-specific solutions that may include an ISV business application like Siebel, SAP, and so on. Those Business Solutions also include some needed IT capabilities, but that is not the primary focus.

The Infrastructure Solutions are aimed at business problems that are typically solved by building more generic IT capabilities, areas like security, application integration, information management, tuning IT to comply with government regulations, and so on. But it is still a “top down” view that starts with the client's business problem (initiative/scenario) and maps it down through selling situations to the products / services / solutions that make up the Infrastructure Solutions possibilities.

11.3.1 On Demand Business: approaches and solutions

As for the mapping of the On Demand Business approaches (Business Transformation and On Demand Operating Environment) to the On Demand Business Solutions and Infrastructure Solutions, it is not exactly one-for-one.

Business Transformation is about changing the way you run your business, from both an operational and a strategic point of view. It helps you to identify and prioritize the business areas in which to invest and change/improve, and also those areas that you might want to sell off or outsource. Part of the invest / change / improve process might require implementing a Business Solution or an Infrastructure Solution.

The On Demand Operating Environment is about transforming your IT capability to match your business requirement. Looking at things from the Operating Environment perspective is a “bottoms up” approach, which intersects with the “tops down” Infrastructure Solutions approach within the specific products / solutions / services / building blocks that make up the solution.

11.3.2 IBM entities with ODOE selection projects

The following section outlines entities samples that exist within the On Demand Operating Environment space that may be considered during the selection of the Infrastructure Management projects.

Autonomic computing adoption model

Autonomic Computing is about Self-Managing Systems that:

- ▶ Increase responsiveness (adapt to dynamically changing environments) (self-configuring)
- ▶ Business resiliency (discover, diagnose, and act to prevent disruptions) (self-healing)
- ▶ Operational efficiency (tune resources and balance workloads to maximize use of IT resources) (self-optimizing)
- ▶ Secure information and resources (anticipate, detect, identify, and protect against attacks) (self-protecting)

Table 11-3 shows the five levels of maturity defined to track progress against the autonomic computing.

Table 11-3 Autonomic Computing Levels of Maturity

Category	Basic Level 1	Managed Level 2	Predictive Level 3	Adaptive Level 4	Autonomic Level 5
Characteristics	Multiple sources of system generated data.	Consolidation of data and actions through management tools.	The system monitors, correlates and recommends actions.	System monitors, correlates, and takes action.	Integrated components dynamically managed by business rules/policies.
Skills	Requires extensive, highly skilled IT staff.	IT staff analyzes and takes actions.	IT staff approves and initiates actions.	IT Staff manages performance against SLAs.	IT staff focuses on enabling business needs.

Category	Basic Level 1	Managed Level 2	Predictive Level 3	Adaptive Level 4	Autonomic Level 5
Benefits	Basic requirements Addressed.	<ul style="list-style-type: none"> ▶ Greater system awareness. ▶ Improved productivity. 	<ul style="list-style-type: none"> ▶ Reduced dependency on deep skills. ▶ Faster/better decision making. 	<ul style="list-style-type: none"> ▶ Balanced human/system interaction. ▶ IT agility and resiliency. 	<ul style="list-style-type: none"> ▶ Business policy drives IT management. ▶ Business agility and resiliency.

At the basic level, IT professionals manage each resource independently and set it up, monitor it, and eventually replace it.

At the managed level, systems management technologies can be used to collect details from disparate systems into fewer consoles, helping to reduce the time it takes for the administrator to collect and synthesize information as the IT environment becomes more complex.

At the predictive level, new technologies are introduced to provide correlation among several managed resources. The management functions can begin to recognize patterns, predict the optimal configuration and offer advice about what course of action the administrator should take. As these technologies improve and as people become more comfortable with the advice and predictive power of these systems, the technologies can progress to the adaptive level.

At the adaptive level, the IT environment can automatically take actions based on the available information and the knowledge about what is happening in the environment.

At the autonomic level, business policies and objectives govern the IT infrastructure operation. Users interact with the autonomic technology tools to monitor business processes, alter the objectives, or both.

The most Autonomic Computing items were integrated into the IBM IT Management Strategy and Assessment engagement model. The Assessment and Solution Approach phases of this engagement model represent the Autonomic Computing Adoption Model, as shown in Figure 11-1 on page 168.

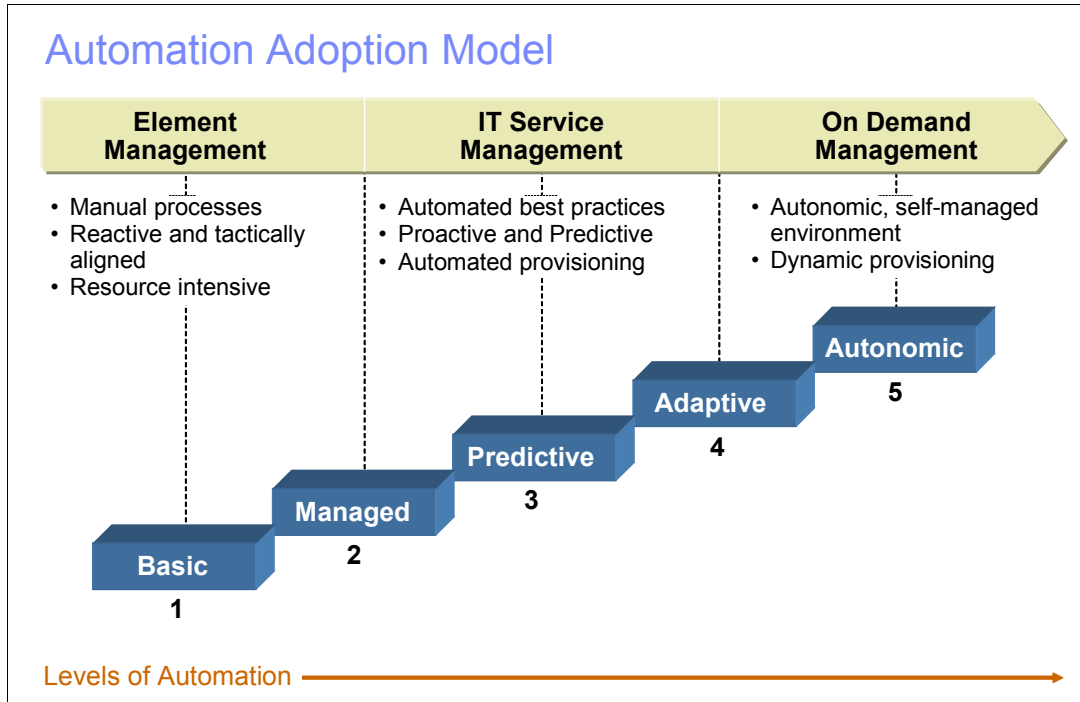


Figure 11-1 The Autonomic Computing Adoption Model

The five levels of Autonomic Computing maturity are grouped into three areas, with focus going from IT to Business:

- ▶ Element Management (manual processes, reactive and tactically aligned, and resource intensive)
- ▶ IT Service Management (automated best practices, proactive and predictive, and automated provisioning)
- ▶ On Demand Business Management (autonomic self managed environment, and dynamic provisioning)

There is a set of typical services provided to understand the autonomic computing maturity in each of the Autonomic Computing quadrants:

- ▶ Self-configuring: Solution deployment
- ▶ Self-healing: Problem bypass/resolution, availability management
- ▶ Self-optimizing: Workload balancing, application instrumentation, performance& capacity management
- ▶ Self-protecting: User administration, security monitoring

For each service, the Autonomic Computing Adoption Model provides a basis for evaluating the current and required levels of Autonomic Computing maturity, as shown in Figure 11-2 on page 169.

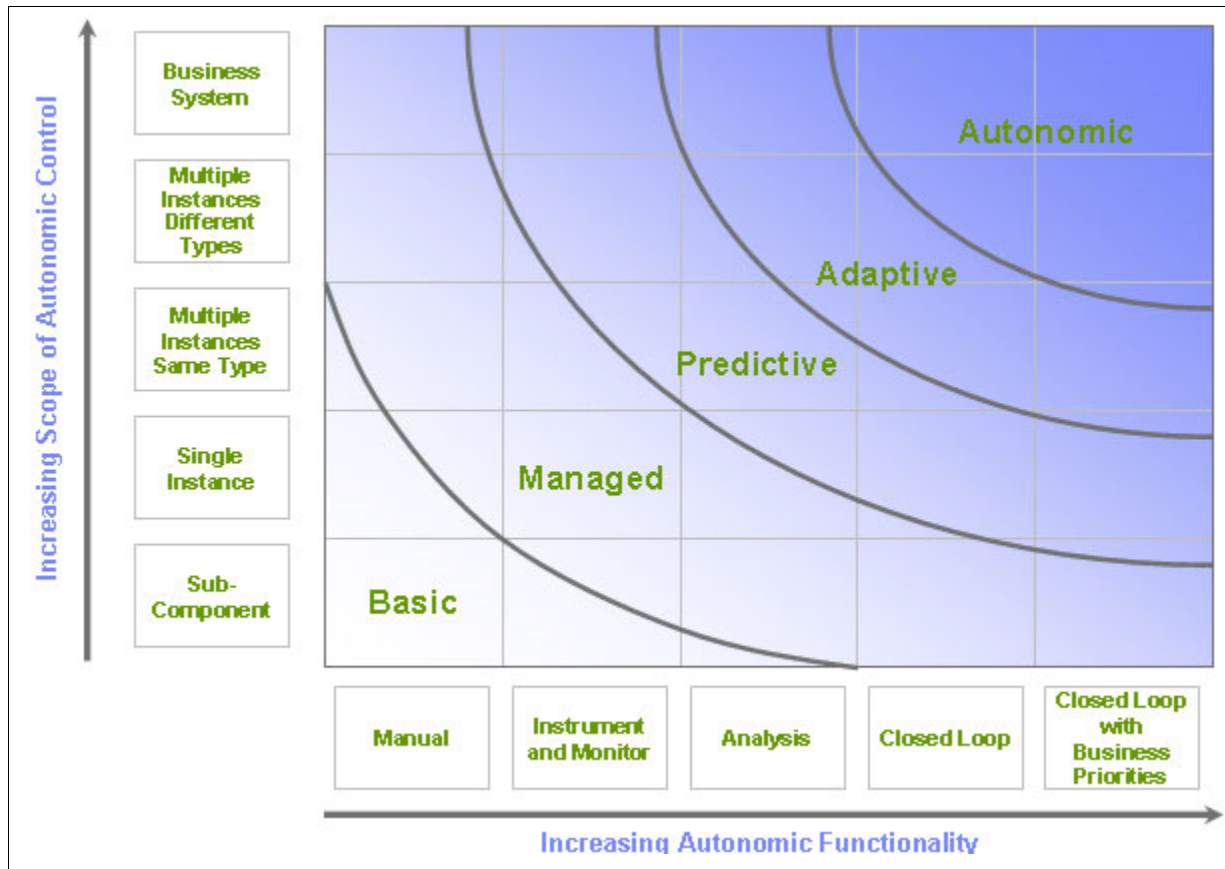


Figure 11-2 Evaluating the current and required levels of Autonomic Computing maturity

Autonomic Computing behavior is possible in many contexts, from single element to complex business systems. Several “design patterns” apply, as shown in Figure 11-3 on page 170.

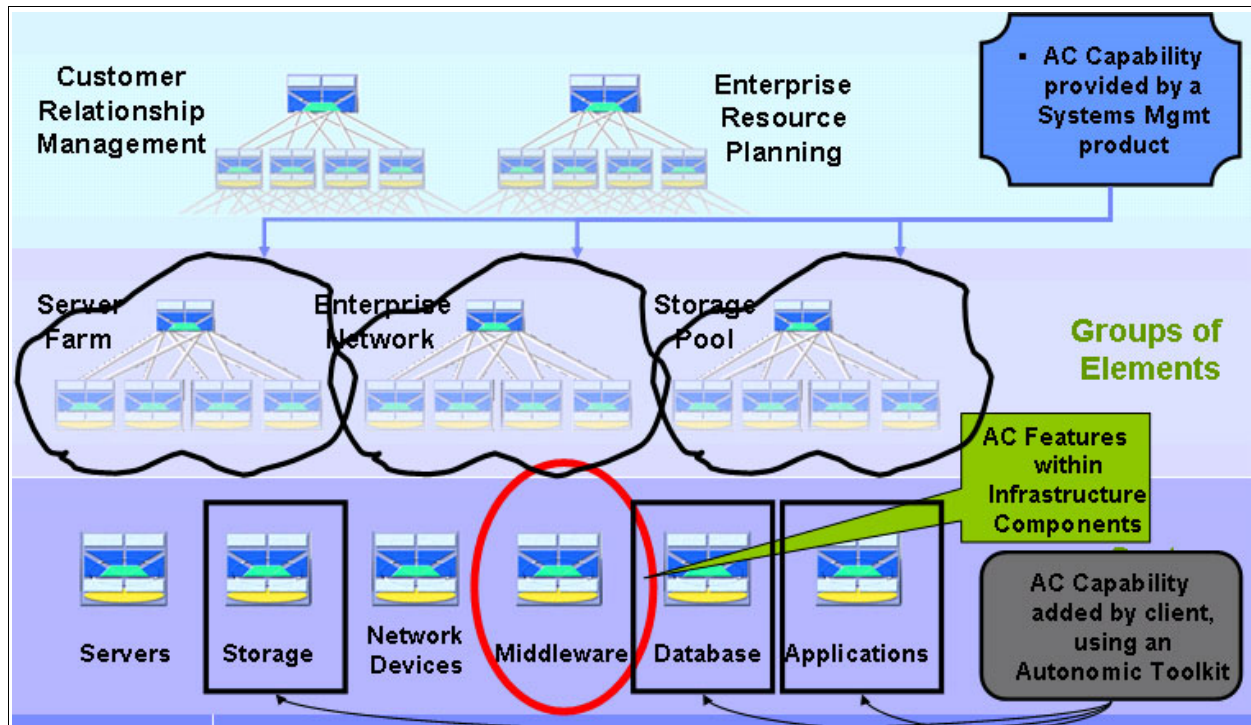


Figure 11-3 Autonomic Computing design patterns

Automation assessment tool

A part of the Autonomic Computing Adoption Model is the Autonomic Computing assessment.

The Automation Assessment Tool enables clients to do a deep dive into four Automation capabilities (availability, security, optimization, and provisioning) and five different areas of provisioning (server and OS, identity, storage, application, and network).

The tool is intended to help assess the maturity of the existing autonomic capabilities and to help guide the development of the autonomic computing strategies. Specific insights and recommendations are provided in six key operational areas that are fundamental to autonomic computing, and provisioning deep dive (Problem Management, Availability Management, Security Management, Solution Deployment, User Administration, and Performance and Capacity Management), as well as providing a high-level view of the potential business value.

The Automation Assessment tool provides a strategic starting point for autonomic computing discussions around:

- ▶ Understanding the autonomic computing capabilities of the existing IT systems
- ▶ Defining the business value of an autonomic computing strategy
- ▶ Establishing an autonomic computing roadmap
- ▶ Identifying autonomic computing products and services that can provide benefits today

Figure 11-4 on page 171 shows a sample of Automation Capabilities Profile as an output of the Automation Assessment Tool.

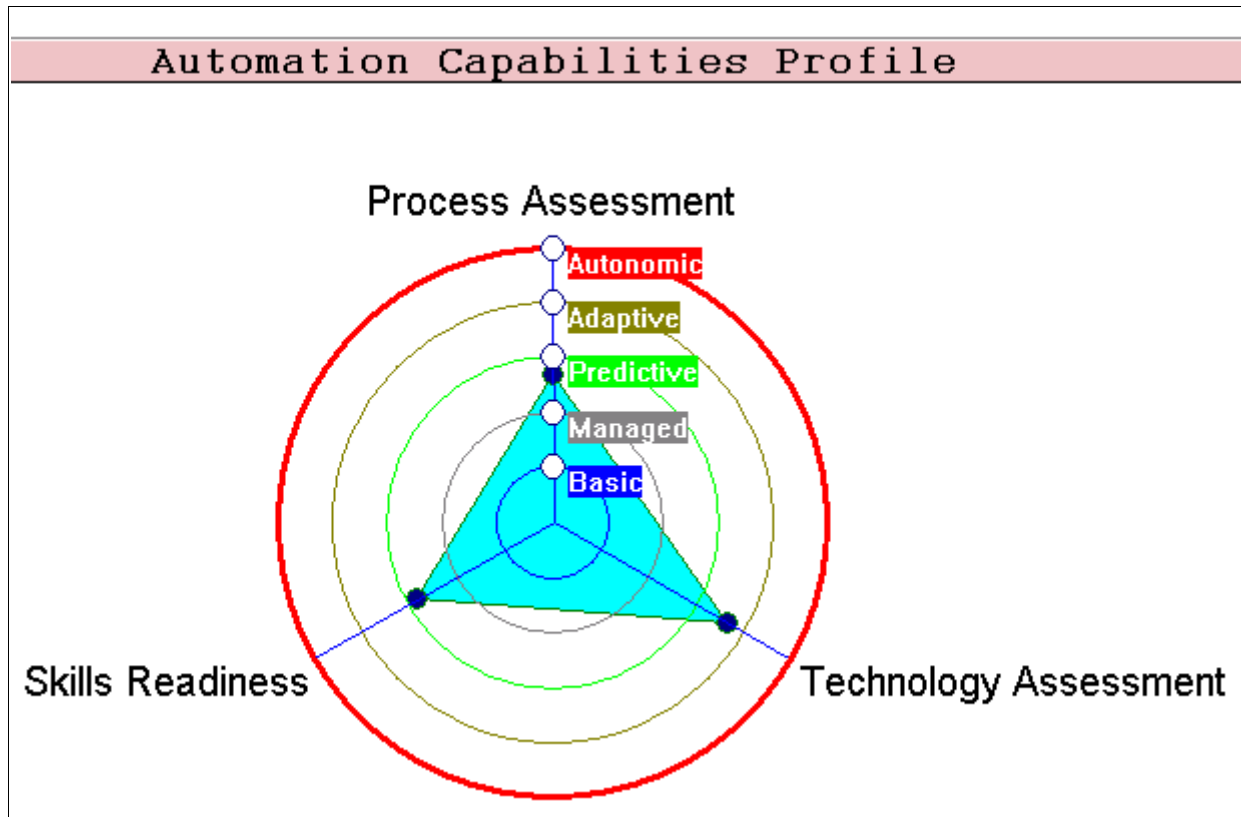


Figure 11-4 Sample output of the Automation Assessment Tool

Incorporation of autonomic computing capabilities into a company's infrastructure should be a key consideration for all organizations moving to an On Demand Business. By advancing the technology that makes up their infrastructure, improving their processes and expanding their skills, organizations can expect to:

- ▶ Accelerate their ability to deploy new capabilities, resulting in greater flexibility and an improved ability to respond to rapidly changing market conditions
- ▶ Improve the quality of service delivered by their infrastructure, resulting in more resilient business operations
- ▶ Increase the return on their IT investments, which translates directly to the organization's bottom line

Grid computing adoption model

A major focus area of grid computing surrounds infrastructure virtualization while dealing with resources as utilities. Grid adoption depends on the ability of this technology to deliver increased business value.

The business issues related to the grid adoption model include key factors, such as leveraging existing hardware investments and resources, reducing operational expenses, creating a scalable and flexible infrastructure, accelerating development time, improving time to market, and increasing client satisfaction and business productivity.

Table 11-4 on page 172 shows a very simplified vision of how some requirements could be associated with common grid terms.

Table 11-4 Requirements associated with common grid terms

Requirement	Grid
Give me a better way of using my existing IT Infrastructure.	Enterprise Grid
Get me compute power when I need it and get it now!	Enterprise Grid
Remove all boundaries between my various types of computers and data. Make unlimited compute power and all information available to me just when I need it.	Enterprise Grid
I need more compute power, but I am tired of the administrative work needed to get it.	Enterprise Grid
Give me the fast access to all the information I need.	Information Grid
I need more compute power to run my application.	Compute Grid

We may consider three stages of the evolution of Grid Adoption:

- ▶ Simple (Cluster scheduling, single application, homogeneous, and storage / file virtualization)
- ▶ Maturing (Advanced scheduling, multiple applications and resources, security, provisioning, workload management, and data virtualization)
- ▶ Sophisticated (Multiple organizations, SLA attainment, orchestration, and meta-scheduling)

Figure 11-5 shows the major factors that influence grid computing adoption.

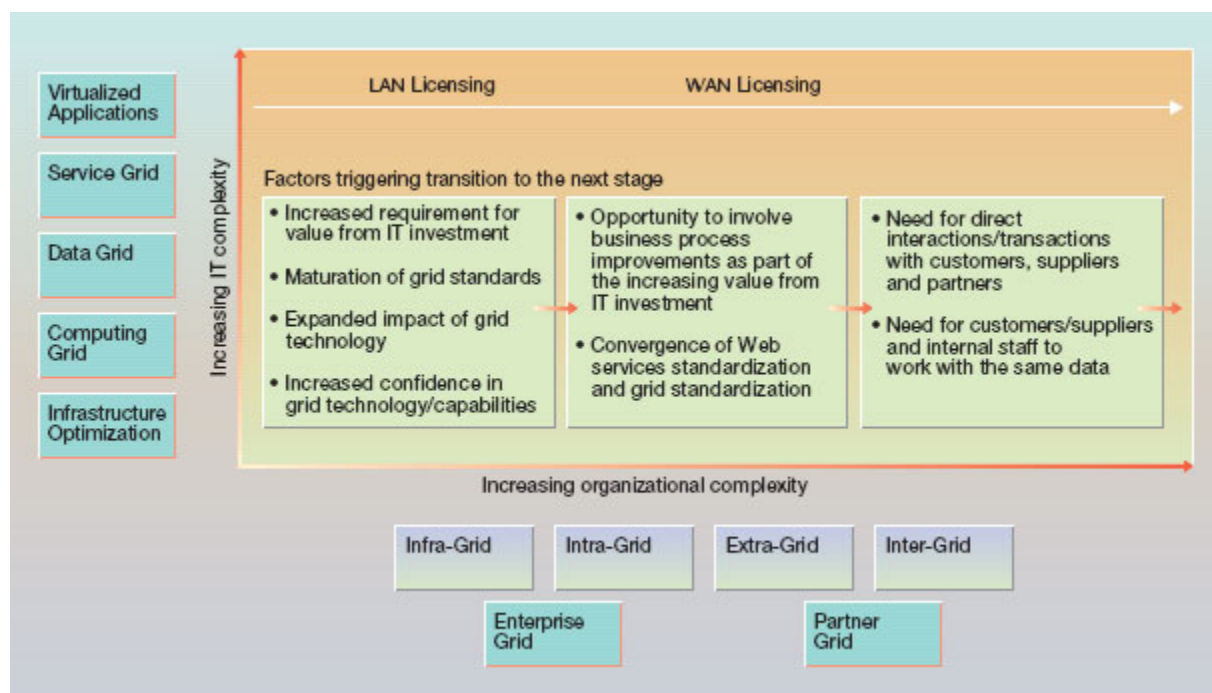


Figure 11-5 Major factors that influence Grid Computing adoption

An organization may do business with other organizations within the enterprise or with external organizations. As a result, grids may involve only internal partners or both internal and external partners. The complexity of the business requirements of such an integration depends on the virtualization requirements, business impact, trust relationships, security

considerations, globalization, and time-to-market requirements of the enterprises involved. Based on differing levels of complexity, grids for the enterprise can be categorized as one of the following types: infra-grid, intra-grid, extra-grid, inter-grid.

A major factor that determines the adoption rate of grid models is the complexity of the IT infrastructure required to implement a grid. The complexity of IT integration across heterogeneous environments is a real challenge. There are various factors we need to take into consideration, including enabling grid resources in homogeneous and heterogeneous environments, enabling resources as services to grid partners, and enabling virtualized applications to grid partners. These requirements at the IT level enable us to classify grids into various categories, with varying degrees of complexity at the integration level, such as:

- ▶ Grids designed to optimize infrastructure
- ▶ “Computing grids” with virtualized processing
- ▶ “Data grids” with virtualization of data and storage
- ▶ “Service grids” with virtualized services to enable easier integration
- ▶ Virtualized applications enabled by composing resources from various partner applications through service interfaces

The combination of business and technical aspects mentioned previously gives rise to the grid adoption model framework. By considering both the technical and business requirements within each cell of the framework, clients considering grid implementations can better anticipate and prepare for their challenges.

The grid adoption framework reveals two significant transition points. At the outset, projects primarily focus on IT and increasing sophistication of IT management capabilities. However, the transition from internal implementations to those involving external partners represents a significant advance and necessitates the involvement of not only the IT organization, but also the rest of the business.

The grid architecture and global standards have a major role in governing the adoption of the grid in the commercial world. Because these standards are still evolving and are not sufficiently mature to support the latter stages suggested by the adoption framework, the framework itself will also have to evolve. These same standards will also restrict the speed with which these latter stages can be attained. However, grid computing and On Demand Business environments have been implemented in several vertical industries (for example, finance, education, life science, and telecommunications), and these implementations seem to validate these stages. The primary benefit of the framework is to clearly articulate what capabilities, both in business and IT, are required before an organization can successfully attain its virtualization goal.

The success of grid computing depends on integration and services orientation. The ability of applications to decompose their capabilities, and then expose themselves as services, is also important for strengthening the SOA. In addition, a key to success in grid adoption is creating virtualized applications to solve specific VO problems by choreographing the business functions exposed through services. This is where global standards and architecture frameworks will help. The standards for Web services and WSRF, aligned with OGSA, assist in this integration. The availability of technology implementations to facilitate such standardization is important. This includes middleware application platforms, resource virtualization engines, workflow models, messaging and correlation systems, and tool frameworks.

Grid adoption framework

The stages for grid implementation are still evolving but, at the highest level, can be segmented between grids within a single company, and grids which involve external partners, as shown in Figure 11-6.

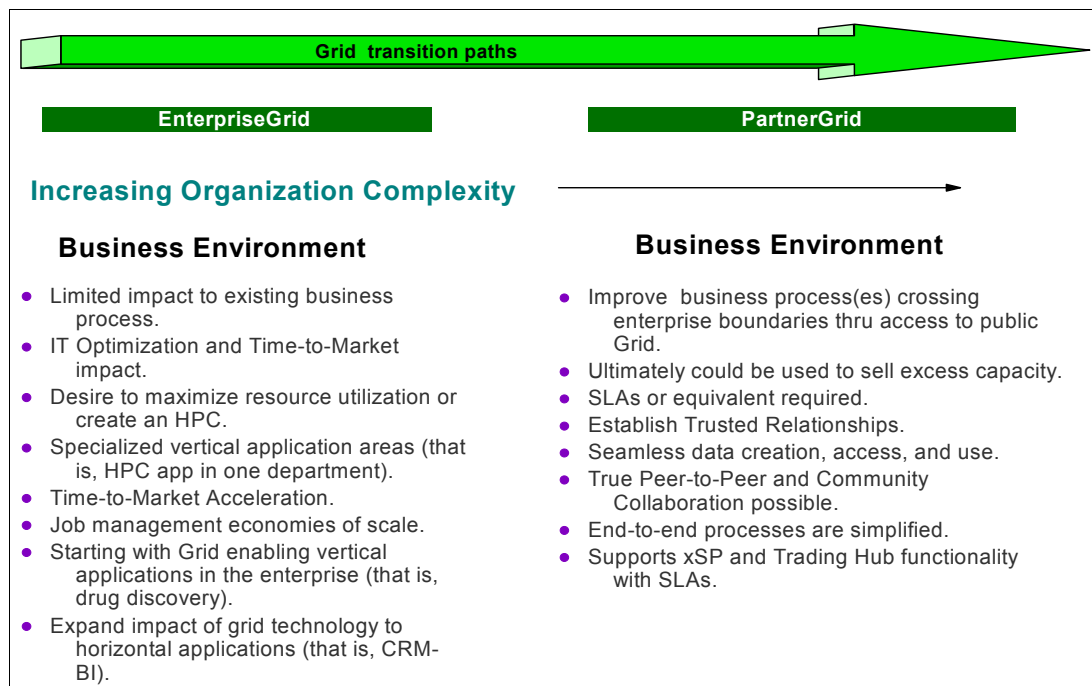


Figure 11-6 Stages for Grid implementation

By increasing the organization complexity, the business is changed, and we may consider grid transition paths going from Enterprise Grid to Partner Grid.

Another transition axis that can be used to examine grid capabilities is the increasing complexity of the technological infrastructure required to support the business objectives, as shown in Figure 11-7 on page 175.

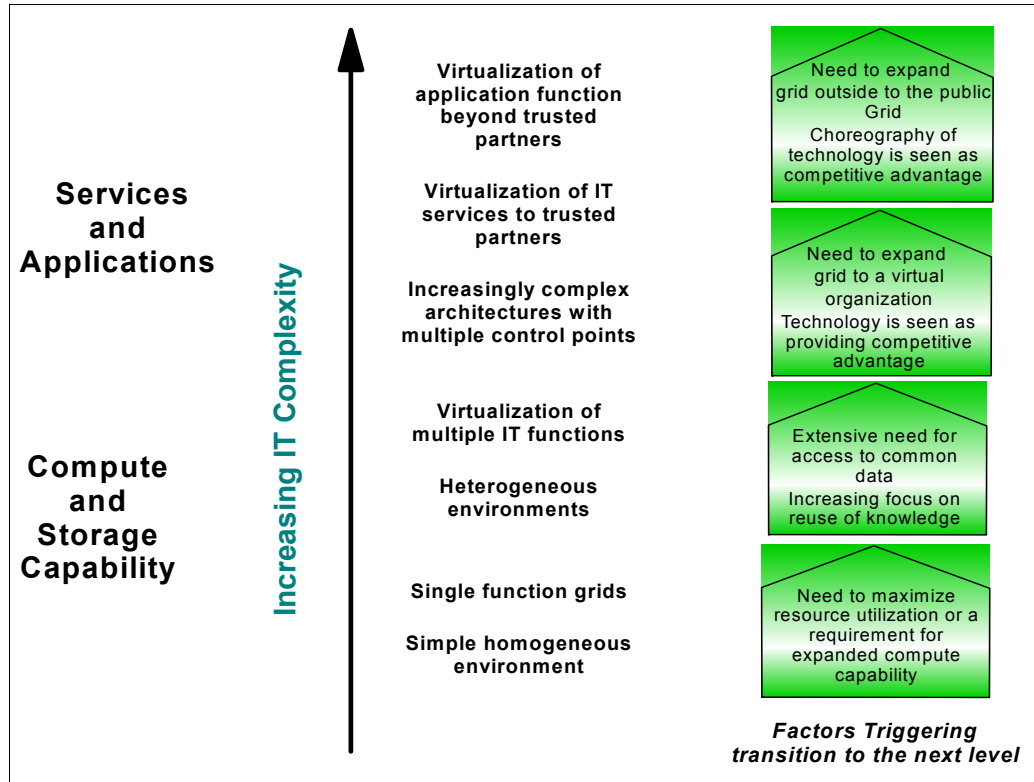


Figure 11-7 The increasing complexity of technological infrastructure

By increasing the IT complexity, in terms of compute, storage, services, and applications, we may consider various levels of grid and virtualization, and factors triggering transition to the next level.

When these two perspectives are combined, a basic framework for examining grid implementation requirements and options emerges, as shown in Figure 11-8 on page 176.

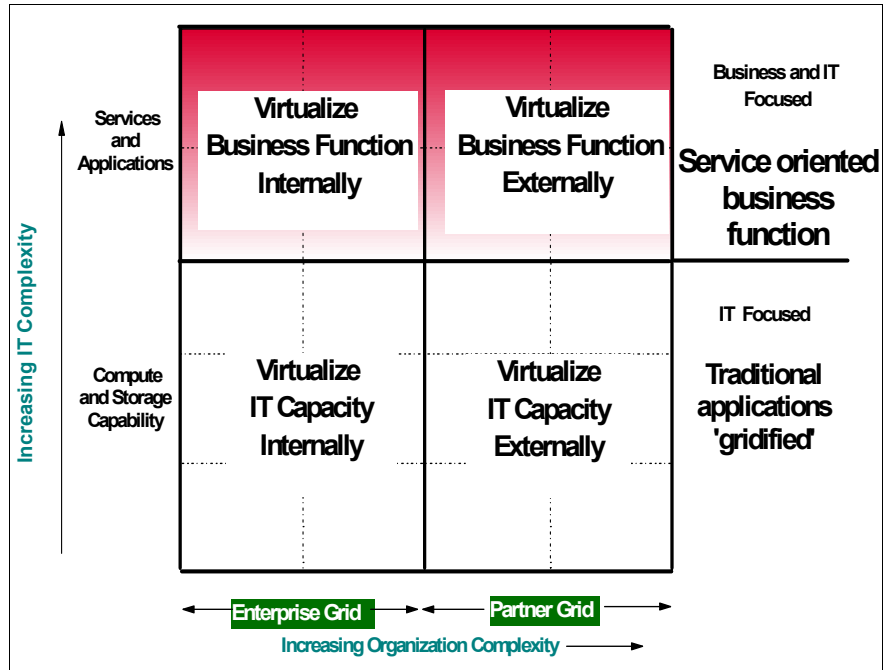


Figure 11-8 Framework for examining grid implementation requirements and options

Based on the X-Axis (Increasing Organization Complexity), the transition from Enterprise Grid to Partner Grid, will virtualize both the IT capacity and Business Function from internally to externally.

Based on the Y-Axis (Increasing IT Complexity), the focus on IT with traditional applications gridified, will be translated to focus on Business and IT with Service-oriented business function.

A logical model for Grid adoption then emerges from the framework, as shown in Figure 11-9 on page 177.

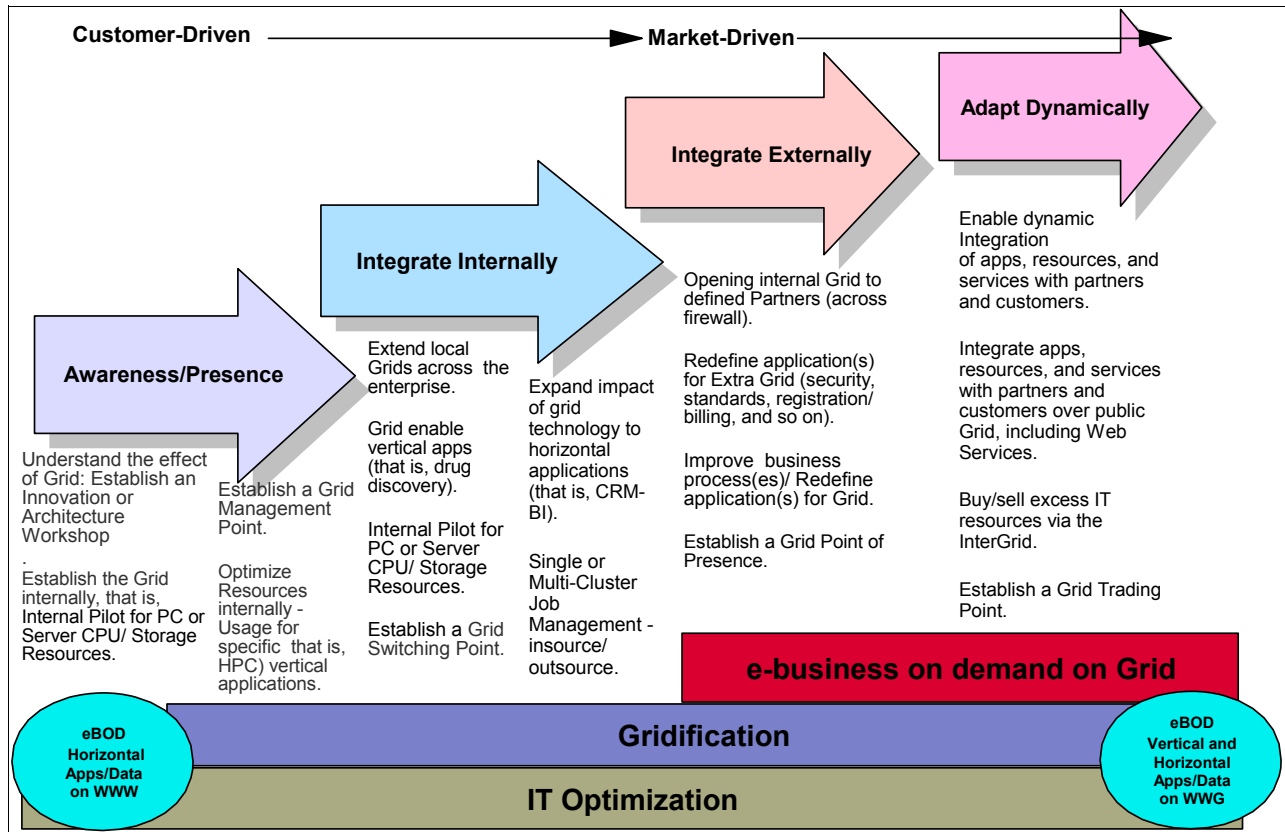


Figure 11-9 A logical model for Grid adoption

The model shows the transition from Client-Driven to Market-Driven, and also from On Demand Business horizontal applications/data to On Demand Business vertical and horizontal applications/data, based on four stages (Awareness/Presence, Integrate Internally, Integrate Externally, and Adapt Dynamically) and their mapping on the evolution from IT optimization, via “gridification”, to On Demand Business on Grid.

Every stage includes steps / activities that could be considered to achieve it.

As a summary, Figure 16 shows the Grid Adoption Model, with its two axes that describe a framework to evaluate grid capability based on organizational and IT capability, including details on:

- ▶ Increasing Organizational Complexity: Enterprise Grid (infra grid and intra grid) and Partner Grid (extra grid and inter grid)
- ▶ Increasing IT Complexity: Optimize infrastructure, virtualize processing (Compute Grid), virtualize data/storage (Data Grid), virtualize services (Service Grid), virtualize applications

Cells in the Framework matrix shows Grid Adoption Components.

Grid Adoption Framework

There are two axis which describe a framework to evaluate grid capability based on **organizational** and **IT capability**.

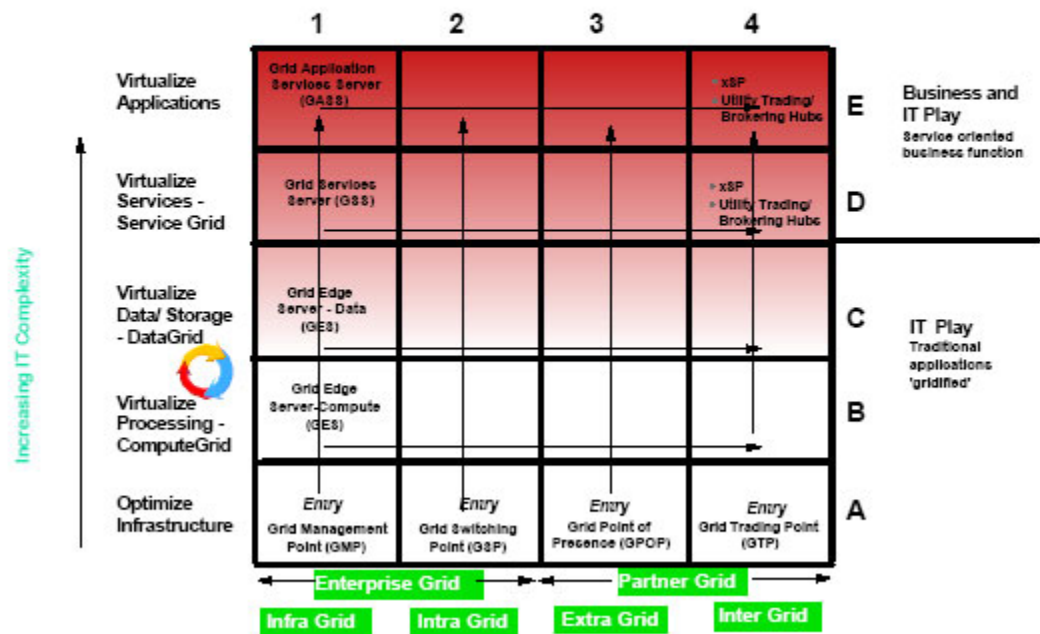


Figure 11-10 Grid adoption framework

Stages of virtualization (including grid computing)

Being able to implement solid virtualization solutions in organizations does not mean they have to change their whole IT environment in one major re-engineering project.

The stages shown in Figure 11-11 on page 179 are indicative of how clients are adopting virtualization today and how they plan to adopt virtualization in the future. Grid Computing is a part of this virtualization adoption.

Virtualization Solutions - Stages

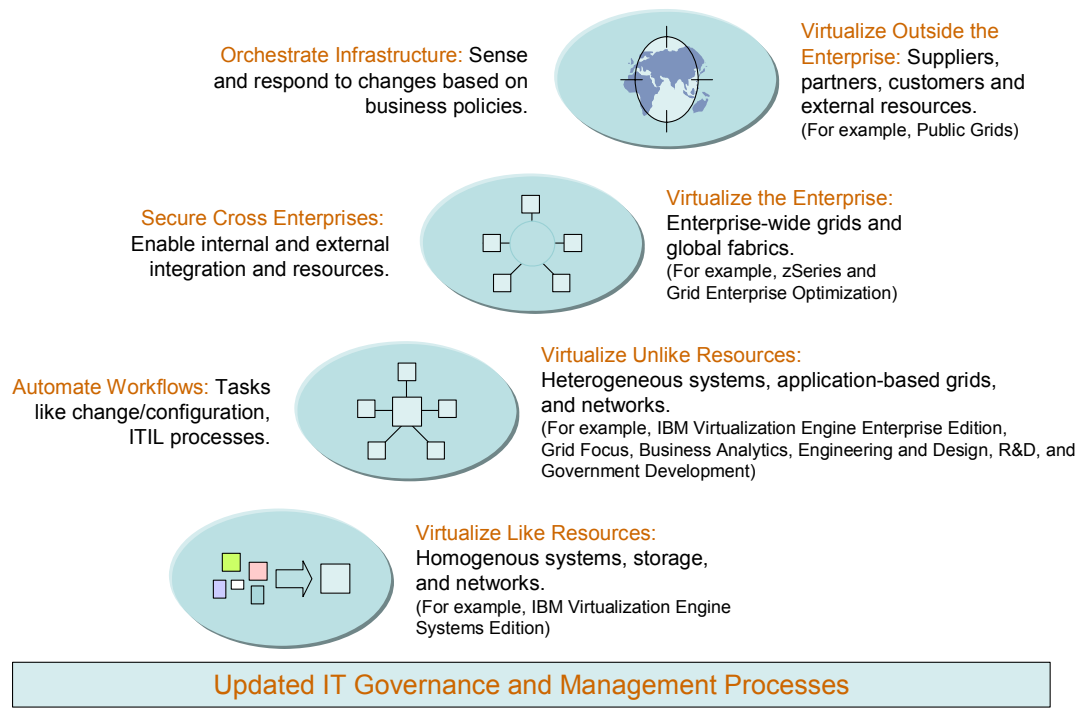


Figure 11-11 Stages of virtualization

The beginning step in the process is to simplify your environment by consolidating similar systems and platforms onto fewer, more manageable resources. Virtualizing similar resources is the first step to simplifying the infrastructure using technologies we see in servers for partitioning (Virtual I/O and Virtual LAN within individual servers). A focus of this stage is on storage virtualization software to tie storage systems together. Most clients are in stage 1 moving into stage 2.

Stage 2 is virtualize unlike resources, which creates islands of virtualization that help solve a business problem and prepare us to get to the more sophisticated step of virtualizing the enterprise.

As the client moves into virtualizing the enterprise (stage 3), a key activity at this point is to start bringing together these consolidated resources across functions within the company. Begin breaking down the silos of technology and sharing resources across functions within the enterprise. By doing this task, a company can use resources that may sit idle at various times of the day to perform tasks that are overburdened at those same times. The ability to share these resources in a seamless fashion gives companies the ability to quickly respond to changing business needs without over investing in technology.

As capabilities improve within an organization, clients are able to move to enterprise-wide virtualization that is enabled by a global virtualization fabric. This fabric utilizes advanced virtualization techniques available through grid technologies and more advance mainframe virtualization platforms to allow seamless access to resources wherever they exist within the organization. This begins to eliminate boundaries between resources that have been created by organizational silos or management processes

Finally, there are organizations using these advanced virtualization concepts not only to access resources within their organization, but being able to truly see resources on demand, whether they are within the company or outside at partner or vendor locations (stage 4). In this state, resources are available when needed, peak demands can be serviced without keeping unused capacity on the floor for extended periods of time, and information flows seamlessly between organizational functions, both within and outside the company.

Grid value at work

A part of the Grid Computing Adoption Model is the Grid Computing assessment.

As grid computing makes the transition from scientific to commercial arenas, many businesses are eager to explore the potential value of this technology. Grid computing has already delivered quantitative benefits to many businesses, but every business is unique. Therefore, IBM Grid Value at Work provides companies with a way to predict expected business value before investing in a grid infrastructure.

Grid Value at Work:

- ▶ Provides critical insight into the true financial and business value of a proposed grid infrastructure using industry templates
- ▶ Examines multiple grid scenarios and non-grid scenarios prior to implementation to predict application performance and return on investment
- ▶ Helps companies identify which applications, usages, and resource expenditures offer maximum value for their specific grid infrastructures
- ▶ Enables businesses to develop a business case for a grid implementation, identifying opportunities for cost reduction and optimal resource utilization

Grid Value at Work makes the business case for grid technology. The value of grid technology depends entirely on how it is applied and managed within a particular environment. Understandably then, a fundamental step to obtaining maximum value from any grid investment is determining the optimal usages for that grid within a particular organization. IBM Grid Value at Work assists in developing a roadmap for clients interested in optimizing the deployment of grids in their businesses. This roadmap includes components for total cost of ownership (TCO) analysis, grid capacity planning, and business valuation estimation to assist in optimizing the grid deployment. IBM Grid Value at Work gives the line-of-business (LOB) or CIO IT executive the flexibility to focus on one or more of these components to determine the appropriate investment levels for grid computing. It also helps develop financial models, including return on investment (ROI) and internal rate of return (IRR), as well as dollar value outputs such as net present value (NPV), cash flow, and payback period. Additionally, the IBM Grid Value at Work technique helps identify a grid's most appropriate usages by analyzing the comprehensive business value of the implementation across all stages of deployment:

When first considering grid computing, companies can take advantage of IBM Grid Value at Work to help predict the business value of the expenditure by comparing alternate grid scenarios, as well as non-grid scenarios, with the current business situation.

- ▶ At the pilot stage, IBM Grid Value at Work helps validate the proposed grid model by extrapolating test results and comparing the financial impact of the pilot to its proposed operational scope.
- ▶ During the grid design phase, IBM Grid Value at Work helps determine the optimal grid blueprint by analyzing the business and financial implications of various infrastructure design decisions.
- ▶ Finally, after implementation, IBM Grid Value at Work helps businesses monitor IT-level indicators of financial value to manage the infrastructure most efficiently.

Figure 11-12 shows the Stages of Deployment considered by Grid Value at Work.

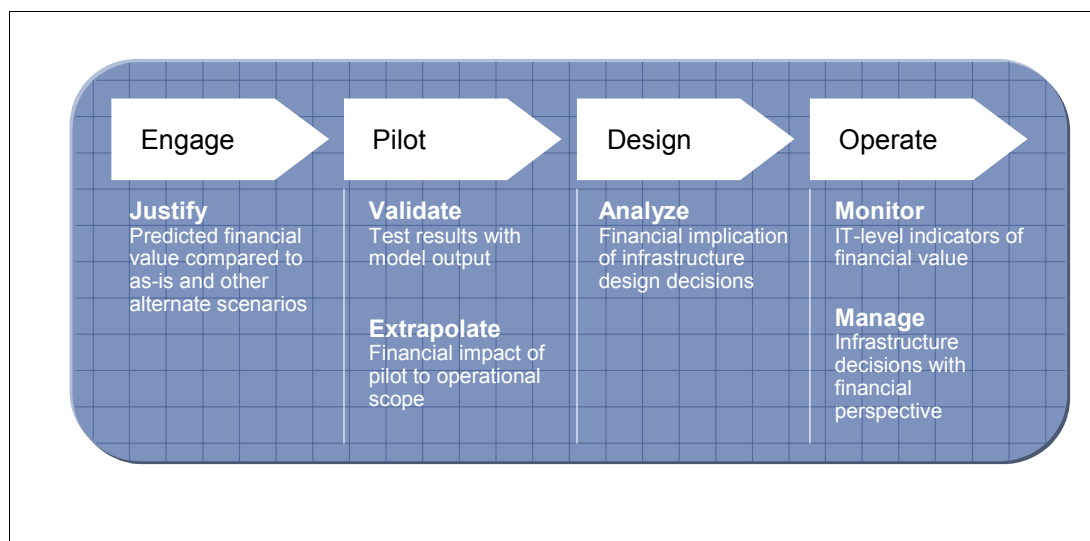


Figure 11-12 Stages of deployment considered by Grid Value at Work

Grid analysis modules provide in-depth understanding of valuation. Because it approaches value estimation from a company-specific perspective, IBM Grid Value at Work provides a thorough examination of the critical value components most scrutinized by executive staff. In particular, the tool features four distinct analysis modules that can be used collectively or individually depending on business priorities.

Grid capacity planner

One of the first objectives in designing a grid is identifying which applications it will run. But how does a company determine the applications that are most technologically appropriate and most cost-efficient? Within IBM Grid Value at Work, the grid capacity planning module helps pinpoint those applications best suited for efficient grid functionality based on performance analysis, grid server utilization data, and a feasibility check. Ultimately, the module provides confirmation that a proposed infrastructure can handle the desired workloads and demands.

By incorporating critical application data, such as usage frequency and run time, along with resource availability information, the module first assesses, from an IT perspective, the basic feasibility of running any given applications on the grid. Next, it analyzes the grid infrastructure capacity required by the applications. Finally, the module examines how the grid itself potentially improves the applications. For example, grid technology can shorten application runtime and enable greater long-term productivity.

Total Cost of Ownership (TCO) estimator

Every business is interested in isolating TCO for a technology investment. This module enables clients to gain a better understanding of the expected cost savings of a grid implementation, as well as the expected expenses of the deployment. For example, a company might save on hardware purchases, but still require budget for grid-related middleware and software licenses. The TCO estimator module can help identify these factors, compare them against the current infrastructure (and any upgrades it might need) and then can present an estimate of the total cost involved in the proposed project.

Furthermore, the tool can be used to examine costs across multiple scenarios and estimate potential TCO for several different grid implementations.

Business value estimator

Real business value, however, derives from more than just TCO. The business value estimator enables companies to identify opportunities for extracting maximum value out of applications on a grid. For example, can a business make changes to achieve greater accuracy, higher volume, or faster throughput? If those changes are made, what is the resulting value to the business? This module also helps define the limitations of a company's potential to benefit from a grid. For example, if a company can increase throughput but lacks the capacity in another area of the business to handle that increase, the benefit is wasted. By identifying any underlying factors in an organization that might limit the performance of a particular business process, companies can detect the need for additional investments or upgrades that will enable them to maximize the benefit from a grid.

Business case builder

Finally, the business case builder incorporates outputs from other modules within the Grid Value at Work tool to present a comprehensive, holistic view of the proposed grid investment. Delivered in standard metrics, such as ROI, economic value add (EVA), NPV, IRR, payback period and cash flow, the business case can be used to discuss the grid implementation with executive team members in a language they both understand and appreciate.

Figure 11-13 shows the IBM Grid Value at Work architecture.

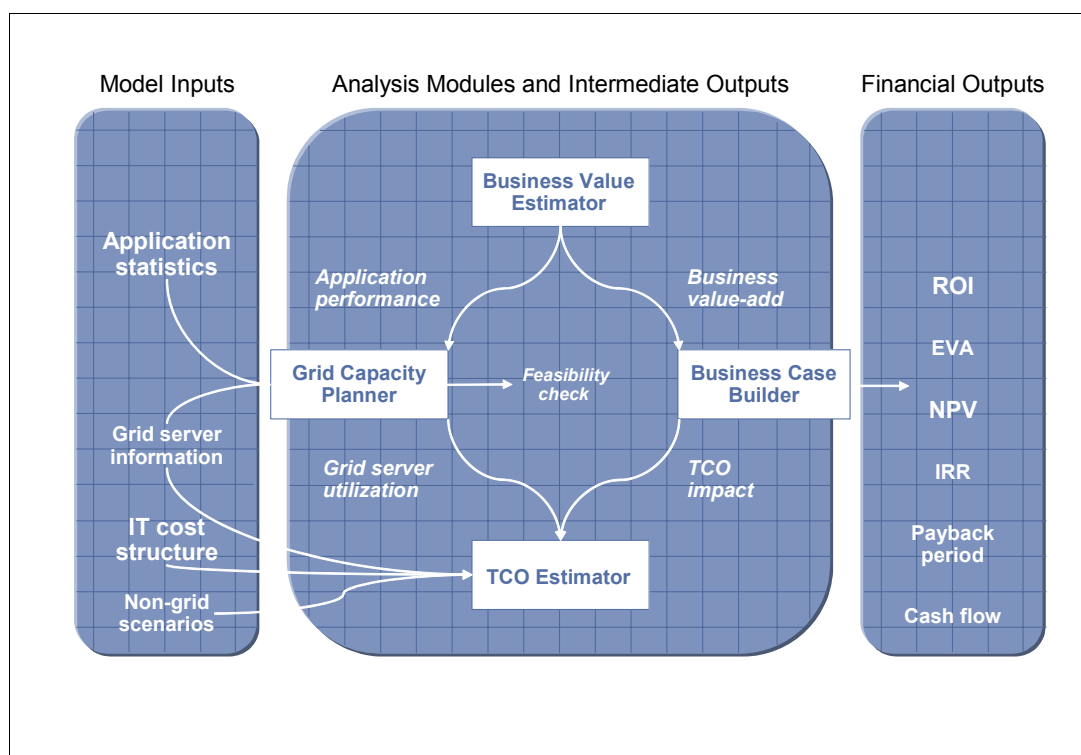


Figure 11-13 the IBM Grid Value at Work architecture

Grid Value at Work can address needs of specific industries. IBM offers specific grid offerings in five areas: business analytics, research and development, engineering and design, enterprise optimization and government. Based on the value propositions of each offering, Grid Value at Work can quantify the following information:

- Business analytics: The business value of improving the speed, accuracy, frequency, or throughput of analysis

- ▶ Research and development/engineering and design: IT infrastructure cost savings and potential benefits from faster time to market or improved design quality
- ▶ Enterprise optimization: Cost savings from virtualization of the IT infrastructure and value derived from exploiting existing, underutilized IT resources
- ▶ Government: Cost savings from integrated information access and shared usage of IT resources across departments and organizations.

Figure 11-14 shows a Grid Business Case (Detailed Financial Analysis) developed by Grid Value at Work - Basic Opportunity Assessment Tool.

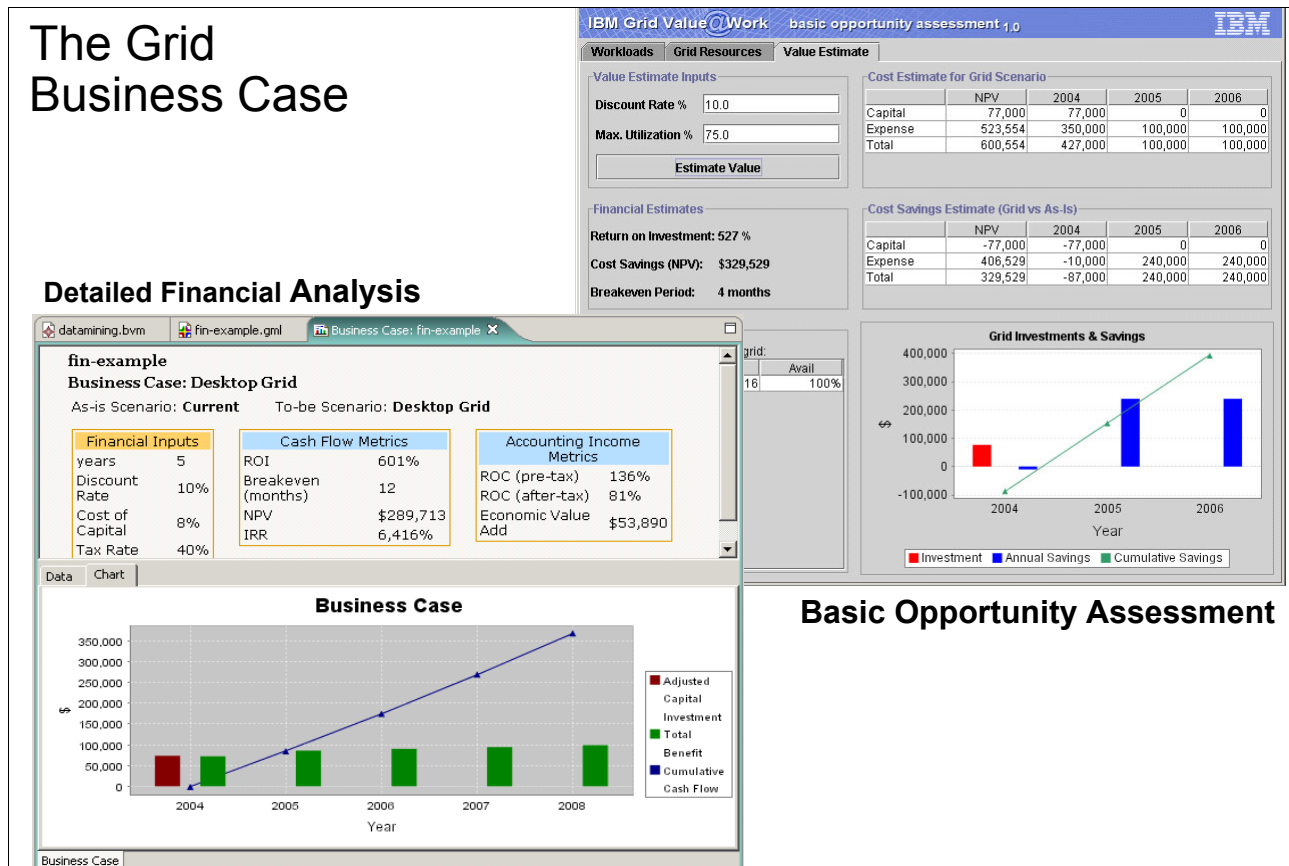


Figure 11-14 Grid business case

IBM Grid Value at Work delivers business value with IT expertise. As a result, companies not only can establish strong business cases to justify the investment in grid technology, but they also can leverage the Grid Value at Work tool to build and manage more powerful, productive grids.

For more information on Grid Computing, please visit <http://www.ibm.com/grid>.

11.3.3 Starting points for On Demand Business

There are multiple starting points to help clients achieve the essential business and IT breakthroughs of an On Demand Business. Some clients require assistance with their business design, while others require assistance with their IT infrastructure or IT processes.

Table 11-5 on page 184 shows possible client starting points for On Demand Business and the associated IBM Techniques.

Table 11-5 Starting points for On Demand Business and the associated IBM Techniques

What	Who	How
How do I start and prioritize for Business Transformation? What is my business plan?	The LOB Executive	Component Business Model
How do I start and prioritize for IT Transformation? What IT projects should I deploy?	The CIO	Component Infrastructure Roadmap
How do I manage the integrated end-to-end IT infrastructure to meet business based service policies?	The CIO and VP of IT Operations	CBM for the Business of IT
How do I architect and design an application environment that supports our Business Transformation goals?	The LOB Executive and VP of Application Development	Service-oriented Modeling and Architecture

A business design scenario

CBM is an innovative and powerful analytical tool to help the clients address their critical business and technology issues. Business components provide the ability to easily view the enterprise through a number of different “lenses,” simply by changing the criteria by which components are evaluated, for example, financial, strategic fit, organizational, and technical. This is the technique used when approaching On Demand from the business design perspective.

If, after performing an engagement utilizing CBM, it is determined that a particular business component is considered to be expensive but critical, and the underlying technology has poorly defined applications, using Business Enablement and Design Services to develop a service-oriented architecture (SOA) might be recommended as a next step, applying the SOMA technique.

If, after performing an engagement utilizing CBM, it is determined that IT cannot deliver the recommended changes due to organizational deficiencies, the next logical step would be a CBM for the Business of IT.

An IT infrastructure design scenario

The CIR technique is applied to identify the current and desired states of a client’s IT infrastructure capabilities, based on their business and IT goals and imperatives.

If necessary, the next logical steps would be CBM-BolT, SOMA, and CBM.

An IT infrastructure policy or governance scenario

A CBM-BolT engagement investigates whether a client has the right IT processes and skills in place to implement and run an IT environment capable of satisfying an organization’s business priorities.

If the identified IT processes suggest the need to improve the IT infrastructure upon which they are dependent, the next logical step would be a CIR.

If the need to re-evaluate particular business processes is uncovered, the next logical step would be a CBM.

If the development of a Services Oriented Architecture would add increased flexibility and thereby enable the IT process changes, SOMA could be a logical next step.

11.3.4 Relationships between IBM techniques for On Demand Business solutions

As for the mapping of the IBM Techniques for On Demand Business Solutions and the On Demand Business Solutions, it is also not exactly one-for-one.

CBM is aimed at driving business transformation, and in the process may generate an opportunity for a Business Solution. And CIR flows the same way for Infrastructure Solutions.

But CBM can also generate a requirement to overhaul the IT infrastructure to support the business transformation, and that requirement could identify a need for either a CIR, or an IS, or both, vice versa; a CIR could identify a potential need to revamp an area of the business that is out of whack with the overall drive to On Demand Business, so you may find a requirement for a CBM engagement or a Business Solution to help move that along. The two areas are not disconnected from each other; in fact, a key facet of On Demand Business is the intertwining of the business and IT capabilities and objectives.

We may consider various relations between the IBM Techniques for On Demand Business Solutions.

Focus: CBM, CBM-BoIT and CIR

Figure 11-15 shows a techniques relationship example with focus on CBM, CBM-BoIT, and CIR.

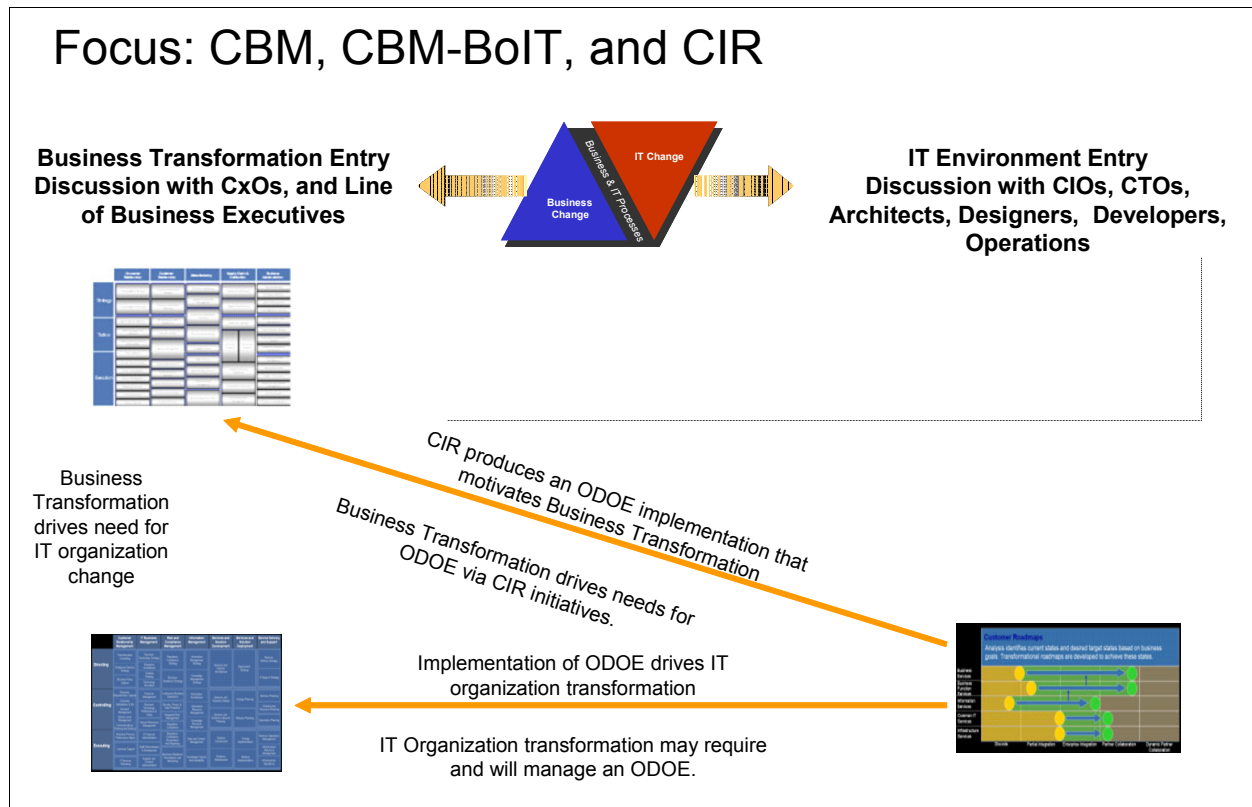


Figure 11-15 A techniques relationship example with focus on CBM, CBM-BoIT, and CIR

In this example:

- Business Transformation drives need for IT organization change
- Business Transformation drives needs for ODOE via CIR initiatives
- IT Organization transformation may require and will manage an ODOE
- CIR produces an ODOE implementation that motivates Business Transformation
- Implementation of ODOE drives IT organization transformation

Focus: CBM, SOMA and CIR

Figure 11-16 shows a techniques relationship example with a focus on CBM, SOMA, and CIR.

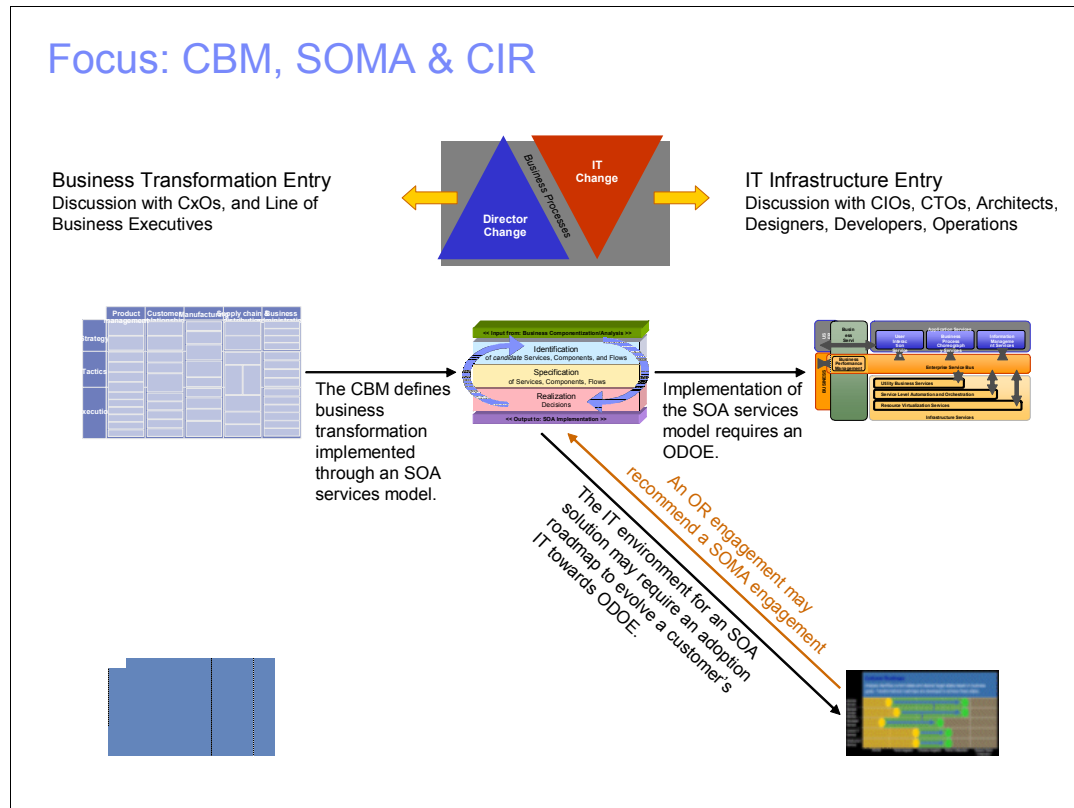


Figure 11-16 A techniques relationship example with focus on CBM, SOMA and CIR

In this example:

- The CBM defines business transformation implemented through an SOA services model.
- Implementation of the SOA services model requires an ODOE.
- The IT environment for an SOA solution may require an adoption roadmap to evolve a clients IT towards ODOE.
- An CIR engagement may recommend a SOMA engagement.

11.3.5 Focus: ODOE and CIR

Figure 11-17 shows a techniques relationship example with focus on ODOE and CIR.

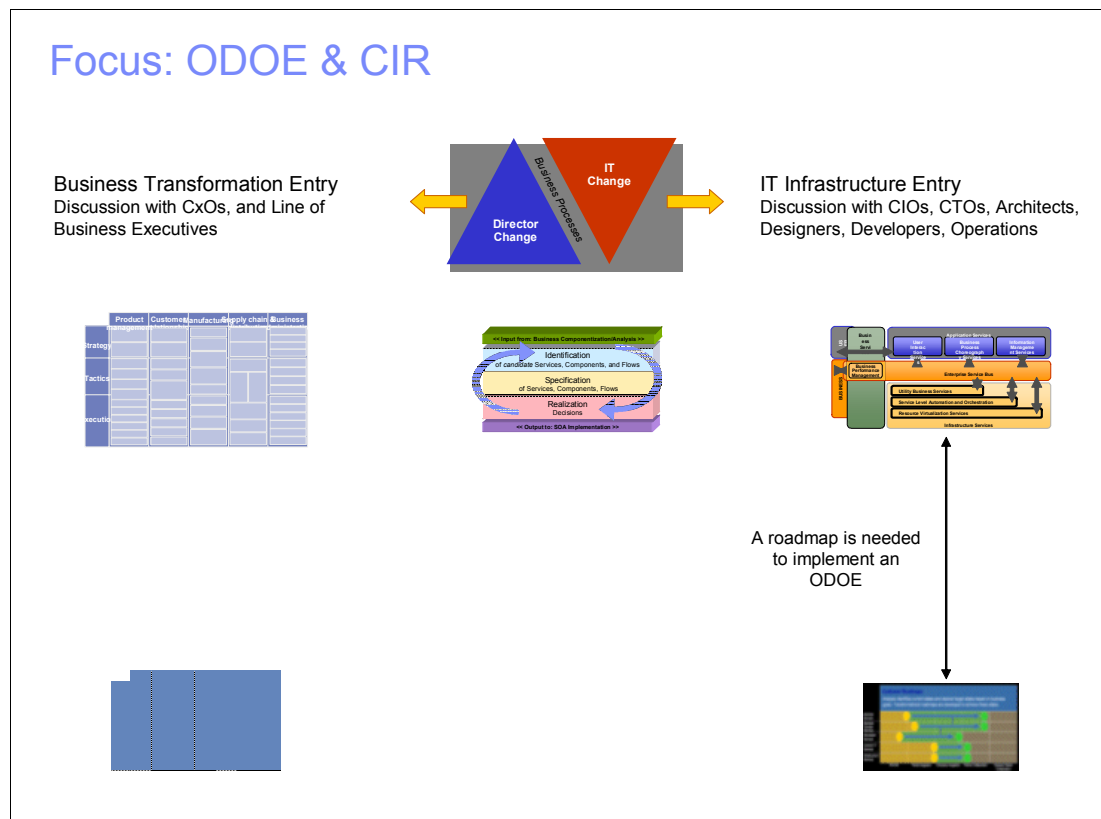


Figure 11-17 A techniques relationship example with focus on ODOE and CIR

In this example, a roadmap is needed to implement an ODOE.

11.3.6 CBM, CBM-BoIT, SOMA, and CIR combined

Figure 11-18 on page 188 shows a techniques relationship example with CBM, CBM-BoIT, SOMA, and CIR Combined.

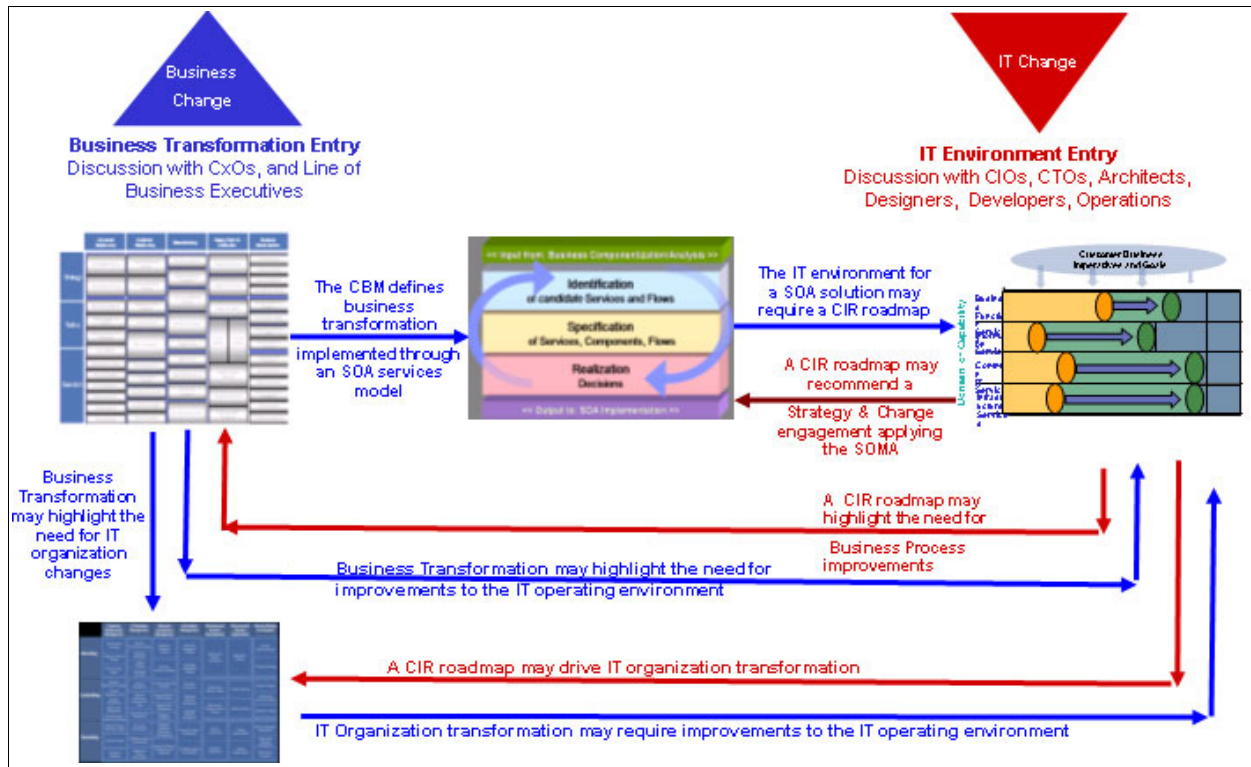


Figure 11-18 A techniques relationship example with CBM, CBM-BoIT, SOMA, and CIR combined

In this example:

- ▶ Business Transformation may highlight the need for IT organization changes.
- ▶ The CBM defines business transformation implemented through an SOA services model.
- ▶ Business Transformation may highlight the need for improvements to the IT operating environment.
- ▶ IT Organization transformation may require improvements to the IT operating environment.
- ▶ The IT environment for a SOA solution may require a CIR roadmap.
- ▶ A CIR roadmap may highlight the need for Business Process improvements.
- ▶ A CIR roadmap may drive IT organization transformation.
- ▶ A CIR roadmap may recommend a Strategy and Change engagement applying the SOMA.

Techniques-based scenarios to identify logical client discussion starting points

Client scenarios have been created to identify logical client discussion starting points, as shown in Table 11-6 on page 189.

Table 11-6 Scenarios to identify logical client discussion starting points

Scenario	Environment	Starting Point
1	Talking to a CEO and business leaders	Business focused discussion that eventually triggers technical initiatives
2	Talking to a CIO staying ahead of the business	Technical discussion about enabling IT to support future business initiatives
3	Talking to a CIO having trouble running IT processes	IT Process discussion about cleaning up existing processes
4	Talking to a CIO who has inherited / acquired multiple environments	Technical discussion about improving the efficiency of the IT environment
5	Talking to a technology driven CIO looking at spot problems	IT Process engagement to set the stage for future engagements

Scenario 1: Discussion with CEO and business leaders

Situation: The business is open to transformation initiatives. IT is driven entirely by business needs.

Objective: Use business transformation to trigger infrastructure and application development transformation.

Lead activity: A business transformation that spawns a number of business and IT activities. Design engagements define services, process orchestrations, and requirements on the infrastructure in the form of a target state. Building the plan for getting to that target state from the current state would trigger an On Demand Business Innovation Workshop utilizing the CIR.

Figure 11-19 shows a possible IBM Techniques relationship for Scenario 1.

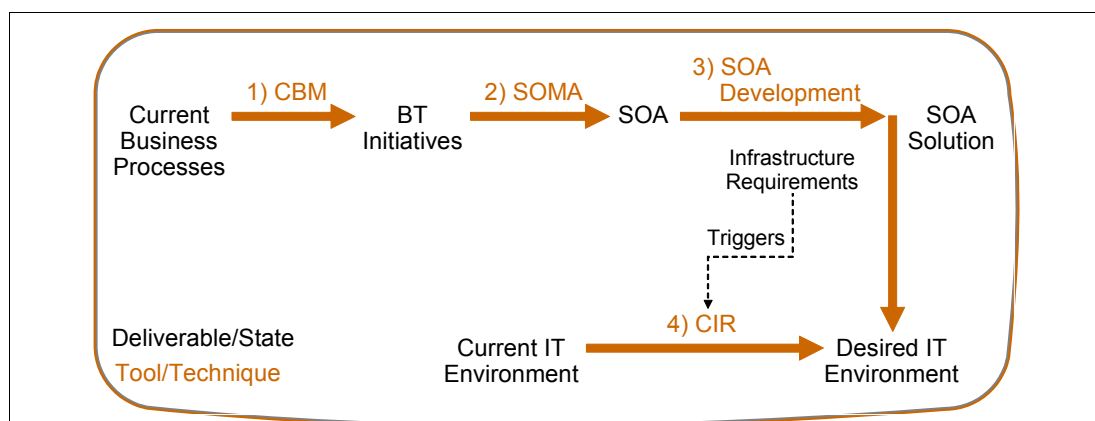


Figure 11-19 A Possible IBM Techniques relationship for Scenario 1

Scenario 2: The CIO is trying to stay ahead of the business

Situation: The Infrastructure and IT processes are in reasonable shape, as per the assessment.

Objective: To create better linkage with the business through demonstrated linkage and value-add

Lead activity: A technology transformation to build an IT environment that supports/enables business initiatives and improves operating efficiency. It may raise ideas or at least motivates the CIO to reach out to his LoB colleagues.

Figure 11-20 shows a possible IBM Techniques relationship for Scenario 2.

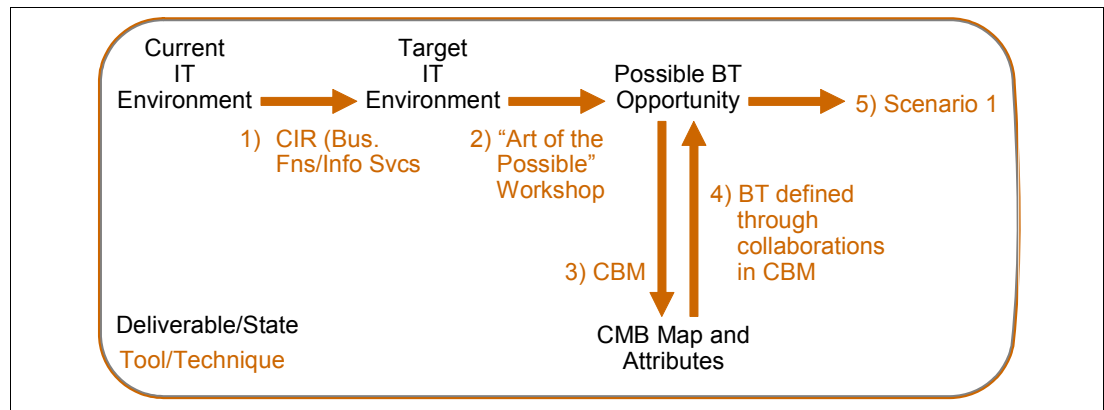


Figure 11-20 A Possible IBM Techniques relationship for Scenario 2

Scenario 3: Talking to a CIO who has concerns about his organization's management and delivery capabilities

Situation: There is inconsistent service level delivery, and no meaningful information to understand the root cause or pre/post transformation with uncertain risks. There are concerns about existing management system efficiency/agility.

Objective: Transform the management system to prepare for technology transformations.

Lead activity: Develop a high level management system transformation plan that will improve efficiency, provide better alignment, and governance. Specific initiatives will spark technology updates that can be solved *or* a CIR can be used to develop a target IT environment.

Figure 11-21 shows a possible IBM Techniques relationship for Scenario 3.

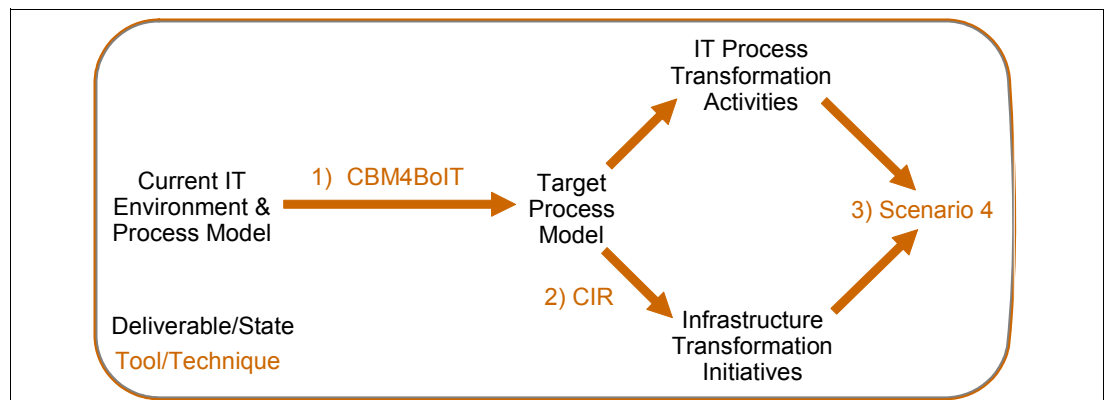


Figure 11-21 A possible IBM Techniques relationship for Scenario 3

Scenario 4: Talking to a CIO who has inherited/acquired multiple environments

Situation: There are inherited problems or problems as a result of mergers and acquisition type situations. You should understand that the infrastructure is diverse and that processes are not efficient.

Objective: To clean up the infrastructure in order to position it to support future responsiveness.

Lead activity: To produce technology and an IT process transformation to build an IT environment that has improved cost control and governance. Also improves responsiveness to the business.

Figure 11-22 shows a possible IBM Techniques relationship for Scenario 4.

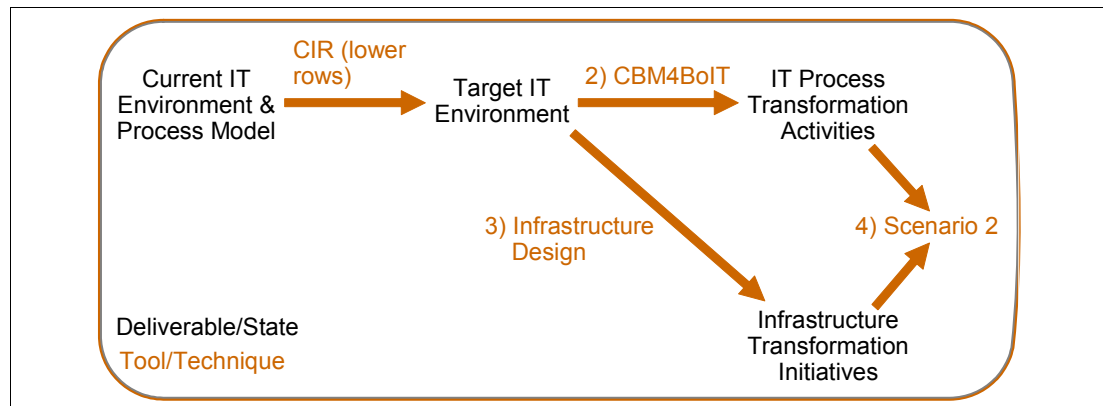


Figure 11-22 A possible IBM Techniques relationship for Scenario 4

Scenario 5: Talking to a technology driven CIO looking at spot problems

Situation: Thinks only in terms of spot (or point) problems and solutions. Does not recognize larger problems.

Objective: To demonstrate larger issues through a point solution.

Lead activity: A point infrastructure engagement. The results and recommendations illustrate larger issues and are used to guide the CIO to Scenario 3.

Figure 11-23 shows a possible IBM Techniques relationship for Scenario 5.

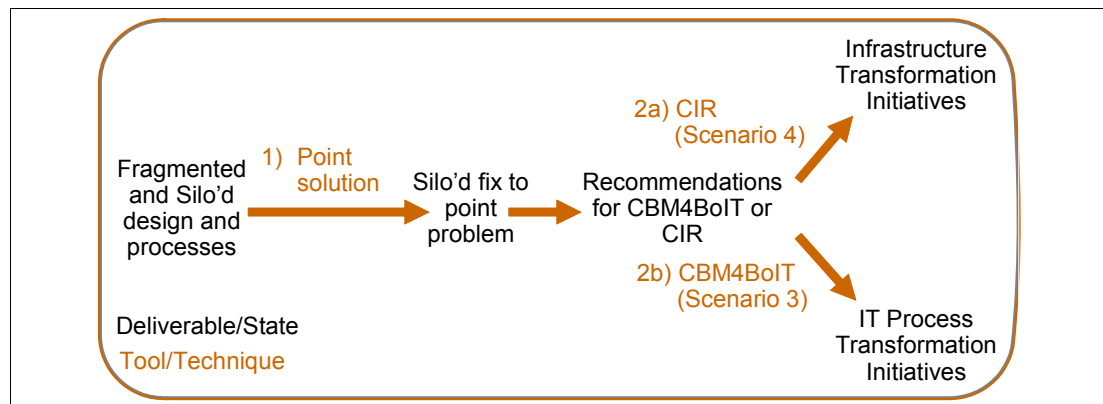


Figure 11-23 A possible IBM Techniques relationship for Scenario 5

11.4 Business Solutions

Business Solutions are services that drive the right technology solution to help solve an entire business process problem for a client. These solutions are highly customizable by the individual client, but are made up of multiple predefined elements and are designed to enable business transformation.

The Business Solutions are categorized in four parts:

1. Industry Specific Business Solutions

Business Solutions that are targeted solely at a specific industry issue.

2. Cross Industry Business Solutions

Business Solutions that address a business issue that is common to multiple industries. A foundation solution is developed and then tailored to each industry.

3. BTO Solutions

Business Solutions that address a business issue where we offer a Outsource transformation approach. The BTO mission is to focus on selected offerings: Procurement, CRM, and so on)

4. ISV Solutions

Business Solutions that focus on solving a clients issue with a specific Tier 1 ISV solution.

For the first two parts, there is a group of Selected Business Solutions per industry as the primary focus.

Figure 11-24 shows the selected Business Solutions per industry.

Communications Solutions	Telecommunications	Distribution Solutions	Retail	Financial Services Solutions	Banking	Industrial Solutions	Automotive	Public Solutions	Government
	Media & Entertainment		Consumer Products		Financial Markets		Electronics		Health & Life Sciences
	Energy & Utilities		Travel & Transport		Insurance		Aerospace & Defense		Education
	<ul style="list-style-type: none"> Service Provider Strategic Transformation (SPST) 		<ul style="list-style-type: none"> Multi-Channel-Retail Merchandising Consumer Driven Supply Chain for Retail IBM On Demand Workplace for Retail 		<ul style="list-style-type: none"> Back Office Operations Front Office Optimization Risk and Compliance-shared ISA code 		<ul style="list-style-type: none"> IBM Auto Mktg Sales and Service IBM Auto Manufacturing Productivity PLM-Auto Embedded Systems Lifecycle Management 		<ul style="list-style-type: none"> Social Services & Social Security Customs, Ports & Border Mgt Enterprise Integration ERP/CRM Network Centric Operations-added 4-18-05 Defense/National Security Road Charging
	<ul style="list-style-type: none"> Production and Distribution Transformation Customer Sales and Service Transformation 		<ul style="list-style-type: none"> Integrated Market Management Consumer Driven Supply Chain for CP CP Core Financials & HR-SAP (Japan) On Demand Workplace for CP (Japan) 		<ul style="list-style-type: none"> Risk and Compliance-shared ISA code Trade Process Transformation FM Data Management 		<ul style="list-style-type: none"> Electronics Value Chain Mgmt IBM Production Solutions Electronics Sales and Service PLM - shared ISA code Embedded Systems Lifecycle Management 		<ul style="list-style-type: none"> Life Sciences Transformation-name change 5-16 Healthcare Provider Transformation-name change 5-16
	<ul style="list-style-type: none"> Utilities Network Revitalization Customer Operations Transformation 		<ul style="list-style-type: none"> On Demand Workplace for T&T Consumer Driven Supply Chain for T&T* 		<ul style="list-style-type: none"> Core Insurance Insurance Front Office L&A Business Performance Transformation-new name 5-16 		<ul style="list-style-type: none"> Supply Chain & Aftermarket PLM - shared ISA code SAP Full Economy-shared ISA code 		<ul style="list-style-type: none"> Enhanced Campus Communication IBM BI/ODW Learning Alignment IBM SIS Learning Alignment
							Chemical & Petroleum		
							<ul style="list-style-type: none"> Upstream Petroleum SAP Full Economy-shared ISA code 		

Figure 11-24 Selected Business Solutions per industry

The combination of IBM middleware, combined with ISV application software and industry know-how (consulting and implementation services), enables clients to realize the full value of IBM Business Solutions, and transform their enterprises to on demand enterprises.

11.5 Infrastructure Solutions

Infrastructure Solutions are cross-IBM offerings that include high-value services and technology to solve an IT problem. As they are customizable and comprised of multiple predefined elements, these solutions focus on infrastructure-wide improvements.

There are two development types for Infrastructure Solutions. These types address top client needs (Business Resilience, IT Optimization, Information Insights, and Business Flexibility), they are based on cross-industry and are industry specific with tailoring, and deliver cross-brand value, including high value services.

The two development types for Infrastructure Solutions are the following:

1. Dynamically customizable solutions

A series of offerings defined to solve clients' IT, organized by need, by industry, and by scenario. It is a very flexible model, and depends on cross-IBM marketing management and strong, cross-brand enablement.

2. Pre-integrated solutions

These solutions are based on same needs and scenarios as the dynamically customizable ones. They are pre-configured, pre-integrated, and pre-tested to reduce time to value. They are less flexible and depend more on up front testing/development.

11.5.1 ODOE capabilities mapping on infrastructure initiatives

As for the mapping of the On Demand Operating Environment capabilities on the driving productivity and optimizing IT priority areas, Figure 11-25 shows a possible solution.

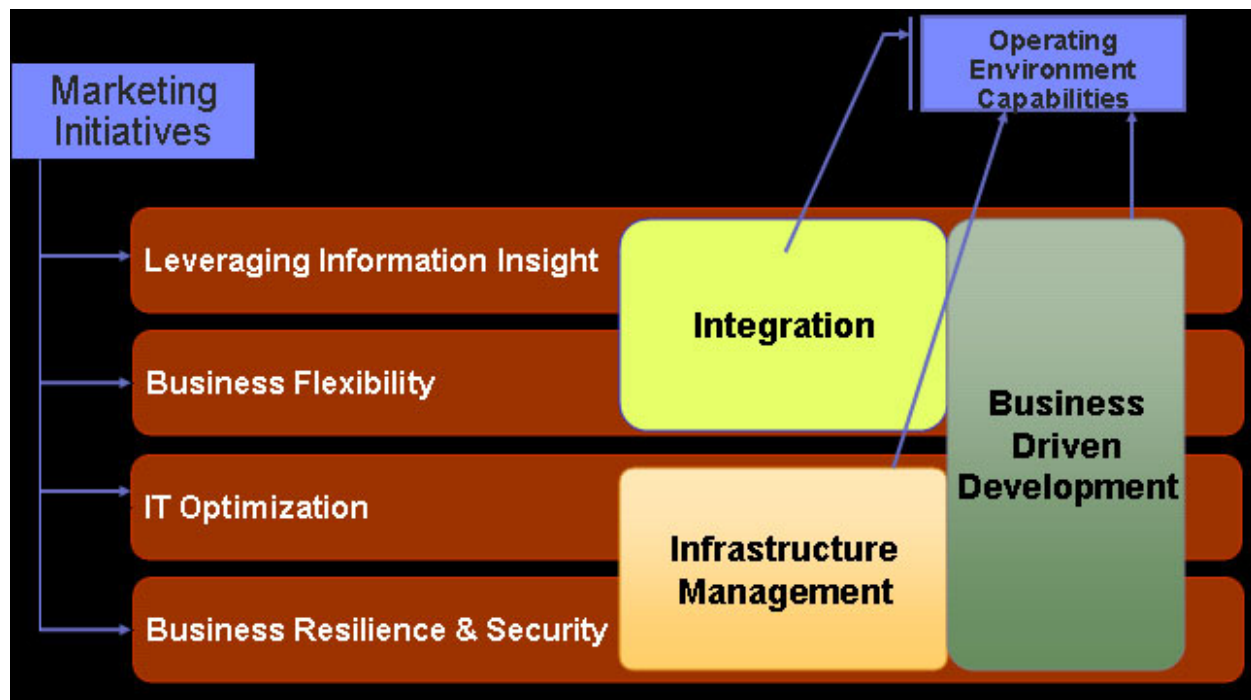


Figure 11-25 Mapping of the On Demand Operating Environment capabilities

We may consider the following relation between the requirements and the capabilities of the On Demand Operating Environment:

- ▶ Business Flexibility Requirements (Increase Business Flexibility and Leverage Information Insight Marketing Initiatives) with Integration People, Process, and Information Capabilities (Business Modeling, Process Transformation, Application and Information Integration, Access, Collaboration, and Business Process Management)
- ▶ IT Simplification Requirements (IT Optimization and Business Resilience and Security Marketing Initiatives) with Infrastructure Management Automation and Virtualization Capabilities (Availability, Security, Optimization, Provisioning, Policy based Orchestration, Business Service Management, and Resource Virtualization (Storage Distributed systems, Grid, and Network)).
- ▶ Business Flexibility and IT Simplification Requirements with Business Driven Development Capabilities

For every On Demand Operating Environment capability, there are groups of IBM products that could represent Infrastructure Solutions, as presented in Table 11-7.

Table 11-7 ODOE Capabilities: Products offerings mapping

ODOE capability	Products
I. Integration	
A. People	WebSphere Portal, WebSphere Every Place Access, WebSphere Voice, and Lotus Workplace
B. Process	WebSphere Business Integration, WebSphere Studio, WebSphere Host Integration, Rational Software Development Platform, DB2 Information Management, Tivoli Business Services Management, and WebSphere Commerce
C. Information	DB2 Information Integration, DB2 Business Intelligence, DB2 Content Management
II. Infrastructure Management	
A. Automation	
1. Availability	Tivoli Monitoring, Tivoli Monitoring for Transaction Performance, Tivoli Monitoring for WebSphere Infrastructure, Tivoli Business System Manager, Tivoli Enterprise™ Console, Tivoli Storage Manager, and xSeries Blade Center
2. Security	Tivoli Risk Manager, Tivoli NetView®, Tivoli Enterprise Console®, pSeries Server, and BladeCenter
3. Optimization	IBM Optimization for zSeries Offering and IBM @server iSeries Enterprise Edition
4. Provisioning	
a. IBM User Provisioning Offering	Tivoli Identity Manager, Tivoli Access Manager, Directory Integrator, pSeries Server, xSeries, and BladeCenter

ODOE capability	Products
b. IBM Storage Provisioning Offering	Tivoli Storage Resource Manager and TotalStorage® Enterprise Storage Server®
5. Orchestration	IBM Tivoli Intelligent Orchestrator and IBM Web Infrastructure Orchestration
B. Virtualization	
1. VE Suite for Servers	Enterprise Workload Manager, Director Multiplatform, Tivoli Provisioning Manager, Grid Toolbox V3 for Multiplatform, Virtualization Engine Console, AND DynInfrastrEnterprEd for mySAP Business
2. VE Suite for Storage	Total Storage SAN Volume Controller, Total Storage SAN File Systems, Total Storage Productivity Center: For Data, For Fabric, For Disk, and For Replication
3. VE Systems Technologies	zSeries, pSeries, iSeries, and xSeries

11.5.2 Infrastructure initiatives scenarios

There are 16 defined Infrastructure Scenarios based on the Productivity and IT optimization priority areas (increasing business flexibility, leveraging information insights, simplifying/optimizing the IT environment, Enhancing business resilience, and security and compliance), also known as Infrastructure Initiatives

Figure 11-26 shows the Infrastructure Initiatives and the different Infrastructure Scenarios.

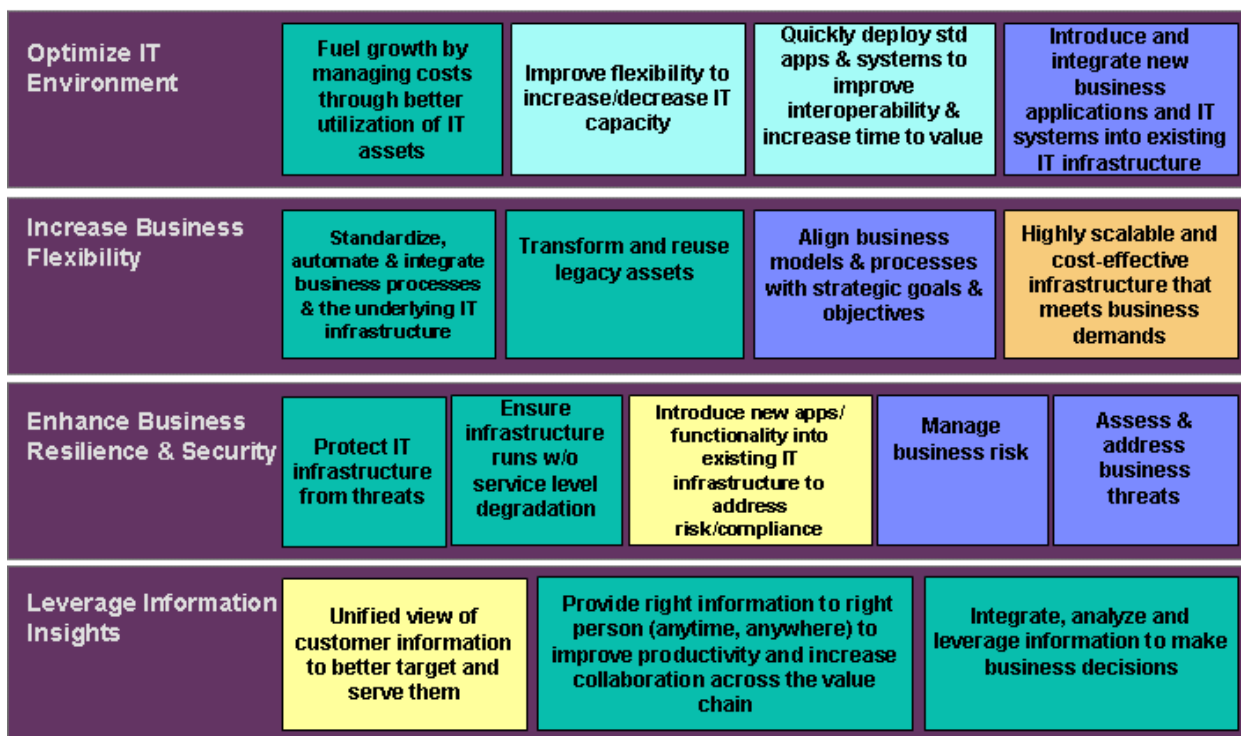


Figure 11-26 The Infrastructure Initiatives and the different Infrastructure Scenarios

Every scenario is developed with solution (products and services) offerings. These solutions can be categorized and grouped into three types, reflecting varying degrees of unique industry relevance:

- ▶ Industry-Specific Infrastructure Solutions (Industry Infrastructure Solutions developed to serve the unique requirements of one industry vertical client set)
- ▶ Industry-Tailored Infrastructure Solutions (Industry Solutions that are tailored with language to make it relevant to the target industry client set)
- ▶ Cross Industry Infrastructure Solutions (Infrastructure Solutions broadly applicable to any industry)

11.6 How to implement an On Demand Operating Environment

The following provides an overview of several approaches or “how tos” that can be chosen to start implementing pieces of an On Demand Operating Environment. Which approach is right for the Solution Designer will depend on the specific business environment and immediate needs.

11.6.1 Creating business flexibility

Clients become On Demand Businesses by increasing business flexibility through both a dynamic business model and an adaptable IT infrastructure. On Demand Businesses need the ability to connect people, processes, and information in a way that enables them to become more responsive to the dynamics of the market, clients, and competitors. This is important within the bounds of any enterprise and is increasingly critical as companies extend their value nets and more tightly integrate partners, suppliers, and clients into their processes.

Business flexibility is achieved through standardizing, automating, and integrating key business processes and the underlying IT infrastructure. It includes managing the performance of these processes, and is supported by a business application portfolio and cost structure that is aligned with changing business needs.

Businesses need to establish the flexibility to respond rapidly and cost-effectively to emerging strategic opportunities. To keep their competitive edge, they need the underlying systems that would complement, not impede, their agility as a business.

To address this problem, businesses need to create a new, open platform for developing and integrating applications. Employing an open, enabled development environment, they can streamline their development process, thus removing what had been an obstacle to the rapid deployment of new services. Process-wise, the key to success is a newfound ability to reuse core service applications across an array of more specialized applications, instead of each having its own underlying engine. This leads to a shorter, lower cost development cycle on the front end, as well as lower application support burden going forward.

The other big benefit of an open development environment is application integration. By enabling the development of “integration-ready” applications, businesses can simplify their integration, further shortening the development cycle. Finally, companies need to simplify the way they manage and integrate their existing services (lowering the cost of supporting them and improving services to clients) and do so without having to rewrite their existing applications.

How to simplify building, developing, and deploying On Demand Business applications

Businesses must be able to quickly define, develop, and deploy new business applications to react to changes in the marketplace. They must also reduce the cost and risks associated with application development and integration.

Whether used by a business analyst, IT solution architect, or application developer, this approach makes it easier to build, develop, and deploy On Demand Business applications. In fact, this approach is all about bringing these worlds together in the quest of making IT more of a “reconfigured” reflection of business needs. This simplification covers more than just how business models can be accessed and executed; it is primarily about making it simpler to define and use those models.

Products that should be evaluated in developing a solution using this approach include WebSphere Business Integration Modeler, WebSphere Application Developer Integration Edition, WebSphere Process Modeler, WebSphere Application Server Enterprise, WebSphere Business Integration Adapter Development Tools, WebSphere Business Integration Applications Adapters, WebSphere Portal, Lotus Workplace, Rational Rose®, and Rational XDE™.

How to improve communication and collaboration within and beyond the enterprise

On a daily basis, employees, clients, partners, and suppliers struggle to find and make use of the most accurate and relevant information available. Once that information is found to have business value, users are looking for ways to communicate that information to others within and beyond their enterprise, to collaborate based on that information, and to make decisions based on it. In short, they use it to impact the business.

This communication can be *ad hoc* or structured, and the participants can be internal or external to the business. Communication and collaboration is not only required and performed between people, but also with applications and data sources and repositories. Data sources encode business-relevant information and applications enable business logic that achieves the necessary communication and collaboration to achieve business goals.

The Service-oriented Architecture model normalizes the basic concepts of people or applications performing activities on information. Activities could include a person consuming data through a portal, or a CICS application performing a transaction.

From a “people” viewpoint, services could be realized, as an example, by a portal-based workplace that enables interactions and by gateway components implementing B2B interactions with external business partners.

From a “process” point of view, the SOA provides a view where people, processes, and information are all represented as services. Existing applications and components can be exposed as services that other services can communicate and collaborate with.

Access to federated information provides the common view and data source transparency that enables people and processes to act in a collaborative fashion on business information.

Products that should be evaluated in developing a solution using this approach include WebSphere Portal Server, WebSphere Business Integration Connect, WebSphere Business Integration Applications Adapters, WebSphere Studio Application Developer Integration Edition, WebSphere Web Services Gateway, DB2 Information Integrator, and Lotus Workplace.

How to react quickly to changes in the marketplace by modifying business processes rapidly

Continuous change is a given for most businesses competing to deliver client value quickly and efficiently. While change is a constant, a company's need to remain focused and on track with its business is critical and requires the ability to modify business processes rapidly.

Through business process choreography, adding, deleting, and re-ordering these steps is made simple. In an open-standards framework based on a Service-oriented Architecture, it is also possible to dynamically replace various components of the process as business needs demand.

Most businesses today are in an environment of continuous change driven by global pressures to provide client value faster and more efficiently. In such an environment, successful enterprises typically maintain focus on their core business competencies. This allows them to be flexible and adapt rapidly to changing business requirements. This ability to adapt includes the definition of new business processes and rapid modification of existing processes to allow higher levels of innovation and efficiency. Automation of manual steps, as well as monitoring and measurement of processes are key characteristics of such flexibility.

The ability to quickly modify business processes must be supported with toolsets that allow rapid formulation and evaluation of changes in business processes, coupled with the ability to reflect these process changes in the supporting information systems in a rapid manner.

The On Demand Operating Environment framework is designed to allow the IT infrastructure to reflect these changes in business processes in a rapid manner.

Briefly, the components of the framework that apply in rapidly modifying business processes to react to market conditions are:

Business process execution: This includes the tools and linkages to allow various users (business analysts, IT architects, and IT developers) to model business processes, and design, build, and deploy systems more effectively. It is a role-based approach with effective flow of information from one role to the other as appropriate for the specific business issue being addressed.

Enterprise Service Bus: This provides a mechanism to connect the various applications and information sources in an enterprise in a manner that can be mapped to the business process being addressed. It is based on open standards and allows effective connectivity of applications both within an enterprise and outside it to partner systems.

Adapters: The approach described in this section is an evolutionary one and facilitates leveraging of existing applications and assets in an enterprise. Adapters facilitate the exchange of information with legacy systems through the Enterprise Service Bus.

B2B connections: Used to map any service to another service that exists outside the enterprise on any available transport channel. B2B connections also provide partner management functions to define the external services, service level agreements, and so on.

Common information and resource model: Provides a consistent way of accessing information across the enterprise.

General strategy

The strategy to allow an enterprise to rapidly modify business processes is based on the following elements:

- ▶ It represents an evolutionary approach that allows an enterprise to get started today and build on its experience and expertise.

- ▶ It leverages investment in existing systems and applications.
- ▶ It leverages the skills and roles in an organization required to effectively transform business processes through information technology. It provides the tools necessary for each role, from business analyst and IT architect to developer, with effective linkages between them.
- ▶ It provides for performance measurements based on business metrics.
- ▶ It is based on open standards to allow greater flexibility and connectivity to systems within the enterprise and outside the enterprise, such as with business partners.
- ▶ It decouples the business process from the IT infrastructure to minimize the impact of change in one on the other.
- ▶ It provides a business-service-oriented view of the IT resources in an organization.
- ▶ It provides loose coupling between various systems, to allow for scalability.

In addition to the technology itself, several other factors are key to the success an enterprise could potentially achieve through this approach. These include:

- ▶ An effective governance model that brings together the line of business and IT functions in an enterprise to ensure rapid response in this environment.
- ▶ Adoption of an appropriate methodology that allows effective use of the tools in the organization.
- ▶ Development of the appropriate skills, which can often involve a combination of business process and technology skills.

Figure 11-27 shows the broad categories of the current client adoption of redesign.

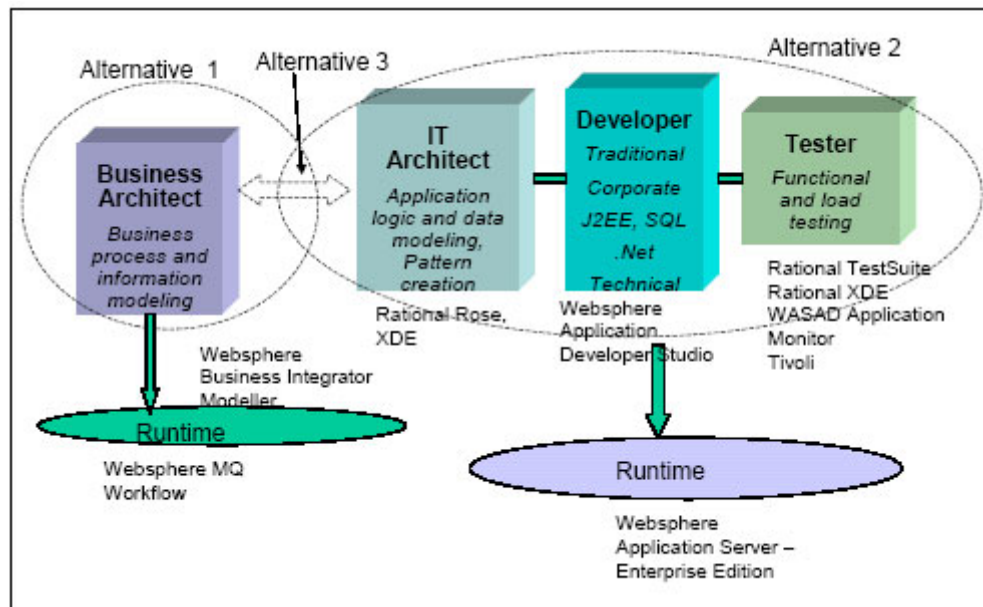


Figure 11-27 Categories of current client adoption of redesign

Products that should be evaluated in developing a solution using this approach include WebSphere Business Integration Modeler, WebSphere MQ WorkFlow, Rational Rose, Rational XDE, WebSphere Application Developer Integration Edition (WebSphere Application Developer Studio), Rational Test Suite, Rational XDE, WASAD Application Monitor Tivoli, and WebSphere Application Server Enterprise Edition.

How to instrument applications and analyze events they generate to understand business process impacts

The ability to monitor performance of a business process based on predefined business metrics is critical to accurate decision making and assessing the return on investment. This begins with an understanding and precise recognition of the business performance metrics that are used to evaluate the success of a process. In addition to business-level events, correlation of IT decisions to the business metrics provides critical information on future investments and IT strategy.

There are three important aspects to this approach. First, one must be able to instrument applications so that they can be measured accurately against business metrics. Second, there needs to be an infrastructure to handle the resulting events and direct them to the appropriate location or person for action. Third, appropriate actions must be taken based on an analysis of these events.

Products that should be evaluated in developing a solution using this approach include WebSphere Business Integration Monitor, WebSphere MQ Workflow, WebSphere Business Integration Message Broker, WebSphere Business Integration Collaborations, WebSphere Interchange Server, and WebSphere Business Integration Server.

How to create links between new and existing applications

All enterprises rely heavily on a variety of applications to manage different aspects of the business, both within their enterprise and connecting to external partners and suppliers. In many cases, an enterprise may have multiple CRM, ERP, or legacy applications across various geographies and business units.

Businesses depend on these applications, regardless of whether they are existing or new, to make appropriate and timely business decisions on a daily basis. Businesses must leverage the investment and value in existing information and applications.

As new applications are added to an enterprise's infrastructure, maximum value can be obtained by ensuring that other facets of the business can take advantage of the related information to create new views of enterprise information, for example, ensuring that a new accounts receivable application links to the existing CRM application or that the new purchase order application links to the SCM application. By failing to leverage existing applications and integrate them with new ones, businesses increase their risk profile and time to value, and reduce their return on investment.

Enterprise business processes serve as a link between applications within the organization. These new and existing applications act as building blocks for the processes that they serve and the challenge is to make it possible to actually use existing applications in the context of new business processes.

As new applications are added to an enterprise's infrastructure, maximum value can be obtained by ensuring that other facets of the business can take advantage of the related information to create new views of enterprise information, for example, ensuring that a new accounts receivable application links to the existing CRM application or that the new purchase order application links to the SCM application. By only deploying, but not linking new and existing applications, companies decrease their return on investment in that implementation by not taking full advantage of the efficiencies that result from an integration between applications.

Products that should be evaluated in developing a solution using this approach includes WebSphere Portal Server, WebSphere Process Modeler, WebSphere Application Server Enterprise Edition, WebSphere Business Integration Connect, WebSphere Web Services

Gateway, WebSphere Business Integration Common Business Objects, DB2 Information Integrator, and Lotus Workplace.

How to react in real time by ensuring a seamless flow of information

An On Demand Business must be able to find and capitalize on the value of information, across its business and independent of how it is stored. Businesses must enable information to flow through the business processes within the enterprise. Information, in all forms, is critical to the continuation and completion of business processes to achieve objectives. Further, businesses must make this information accessible to employees, clients, partners, and suppliers in a way that makes it simple to interpret and take action in real time.

Enterprises have significant investment and value in the “legacy information” in an enterprise. Users require the flexibility to define what kind of information they are interested in, independent of where the “real” information is stored or what application generates and maintains it.

To ensure seamless flow of information, it should be easy to interpret. Fields such as date, time, name, and more can all be compared and viewed in the same way. With normalized data fields, analytics can be applied to that information to assist with more complex interpretation, like identifying patterns in the data.

Briefly, the components of the framework that apply to information integration are:

Access and collaboration: As information flows seamlessly through the business process, many individuals need to interact with that information in different ways. The information must be presented to the user in a personalized manner, depending upon their role and the task they are performing. This presentation must be dynamic, allowing changes to be presented in real time. In addition, the tools used must mirror the dynamic and *ad hoc* nature of collaborative and project teams as they come together to work on a particular problem or issue that may represent a step or task in a larger work flow or decision-making context. These collaborative and *ad hoc* workflow capabilities are key to providing flexibility to the people in an On Demand Business as they complete the tasks in a business process.

Business process execution: This includes the tools and linkages to allow various users, such as business analysts, data architects and administrators, and IT developers to model the information required to make decisions, and design, build, and deploy systems to provide this information more effectively. It is a role-based approach with effective flow of information from one role to the other, as appropriate for the specific business issue being addressed. This must be provided in a flexible and rapid manner, with enterprise-level information available to enhance decision making.

Enterprise Service Bus: This provides a mechanism to connect the various applications and information sources in an enterprise in a manner that can be mapped to the business process being solved. It is based on open standards and allows effective connectivity of applications both within an enterprise and outside it to partner systems.

Common information and resource model: Provides the foundation for a consistent way of viewing and accessing information across the enterprise and with its business partners.

General strategy

The general plan for this approach is as follows:

- ▶ Analyze and model the information requirements for the extended enterprise.
- ▶ Determine the information integration approach, such as federation, caching, and so on.
- ▶ Develop business metrics to measure the effectiveness of the system.

- Architect the federated system (if appropriate) and develop it based on open standards so that it can integrate with the Enterprise Service Bus. The required information is provided and accessed as a “service.”
- Plan and develop the user interface, personalized based on role, with collaborative and *ad hoc* workflow capabilities.
- Test, deploy, and monitor the system.

As a solution component for access and collaboration, a portal technology could be considered. Figure 11-28 shows Portals in an On Demand Operating Environment.

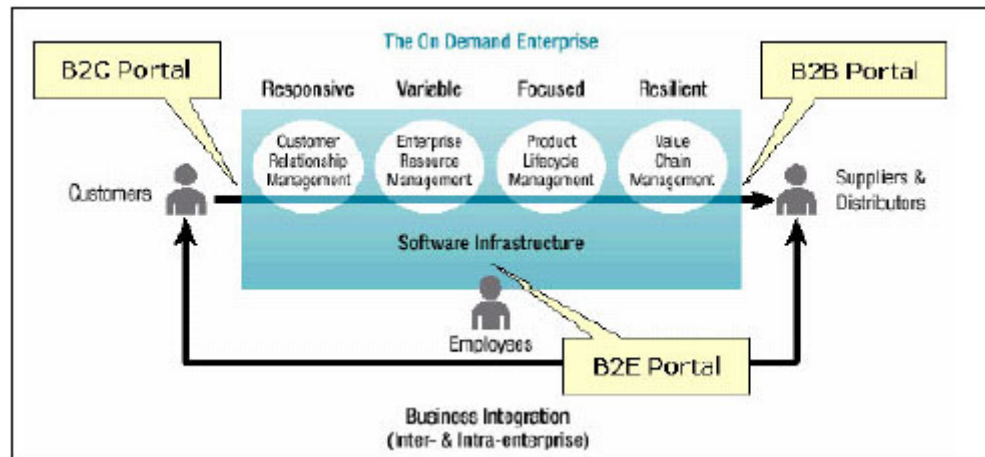


Figure 11-28 Portals in an On Demand Operating Environment

Products that should be evaluated in developing a solution using this approach include Lotus Workplace, WebSphere Information Integration, DB2 XML Extender, and WebSphere MQ.

11.6.2 Managing the infrastructure

IT simplification through automation and virtualization enables access to a network and creates a consolidated, logical view of resources across a network.

Most enterprises evaluating the On Demand Operating Environment will consider a “start small” approach focused on an area or issue that addresses their current business imperatives or pain points. This is consistent with the vision of the On Demand Operating Environment, based on its modular technology framework and iterative methodology. It also allows enterprises to leverage their existing systems and skill base as they enhance their functions and capabilities.

How to secure access and control of information, resources, and applications

Information in data stores such as databases, transactional systems, file systems, and even Web Services is becoming increasingly accessible within enterprises as well as from the external world. The same applies to enterprise operational entities, such as applications, business process workflow, operating system processes, and traditional batch jobs. The IT challenge is to secure and control access to information and operational entities automatically in real time. This requires synchronization of identity across the infrastructure as well as a consistent set of policies regarding access control. The goal is to provide controlled, yet pervasive access to information and applications as it is needed based on the demands of the business. The objective is to allow for the dynamic mapping of identities to data sources in real time, thus minimizing any delay in making data available to authorized users.

In very practical terms, securing the On Demand Operating Environment requires a distributed security mechanism for authentication and access control within and across organizational boundaries. To provide consistent access, the security architecture for the On Demand Operating Environment supports, integrates, and unifies popular security models, mechanisms, protocols, platforms, and technologies to enable a variety of systems to interoperate securely.

The security of the On Demand Operating Environment is built upon the Web Services security specifications. For more details, see the Web Services Security Roadmap at:

<http://www.ibm.com/developerworks/security/library/ws-secmap/>

Specific bindings for security will provide protocol-specific details and security functions, such as confidentiality, integrity, and authentication. For example, transport bindings over a Secure Socket Layer (SSL) connection provide a secure connection between two end points: WS-Security is used to secure SOAP messages and WS-SecureConversation establishes a security context and derives session keys.

As businesses become more dynamic, so do their security, configuration, and user provisioning requirements. In a dynamically provisioned environment, new users may need to be added or deleted. Group access control lists may need changes. Such changes need to be reflected within the infrastructure, and synchronized, so that the security policies can be effective immediately. Similarly, policy changes such as the granting or revocation of access rights, and changes in membership and profiles that affect access rights, should be capable of being changed dynamically, enabling runtime decisions in real time to allow pervasive yet selective and secure access to resources. Web Services-based specifications such as WS-Policy and WS-Security Policy, provide the basis to unify already existing policy models.

General strategy

The components needed to implement this approach have to respect the general attributes of an On Demand Operating Environment, specifically that it be:

Self-managing: When any modification is brought to the environment (for example, employee hiring, job move, end of contract, new application being rolled out, or new systems being deployed), and is accepted at the company policy level, the security aspect of the change must be reflected, and enforced with limited human intervention.

Scalable: The solution that is deployed must be able to adapt itself to an increasing number of parameters (meaning number of users, number of groups, type of information stored for any objects, and so on), and also be able to respond to an increasing number of requests for user or data authentication.

Resilient: The security components used to implement this approach are a mandatory part of the complete solution. If security is faulty, then users will not be able to access critical information or applications and the business will suffer. For that reason, these components need to be resilient, meaning that the software and hardware parts must be able to react to an interruption of service by relocating themselves in a different portion of the IT environment.

Economical: Any solution today needs to be economical, and a security solution is no different. The cost of the hardware and software is not the only factor; the overall cost of providing security administration needs to be understood. A centralized solution that can provide a consistent application of the enterprise's security policies in an automated fashion helps reduce the administrative overhead of keeping an IT environment secure.

Open standards-based: The only way that a centralized solution can provide consistent enforcement of policies related to a large number of platforms, operating systems, applications, and data stores is by building on and using open standards. New components

can be added to an environment where security is based on widely accepted open standards without the need to modify or adapt the security model. In the security area, many open standards have already been adopted. Among them, we find Secure Socket layer (SSL), Transport Layer Security (TLS), Private Key infrastructure (PKI), and Lightweight Directory Access Protocol (LDAP). In addition, Web Services Security standards are evolving and are being adopted as well.

Identity Management is one the main capabilities that should be addressed as part of a security solution.

Figure 11-29 shows various capabilities of an identity management solution.

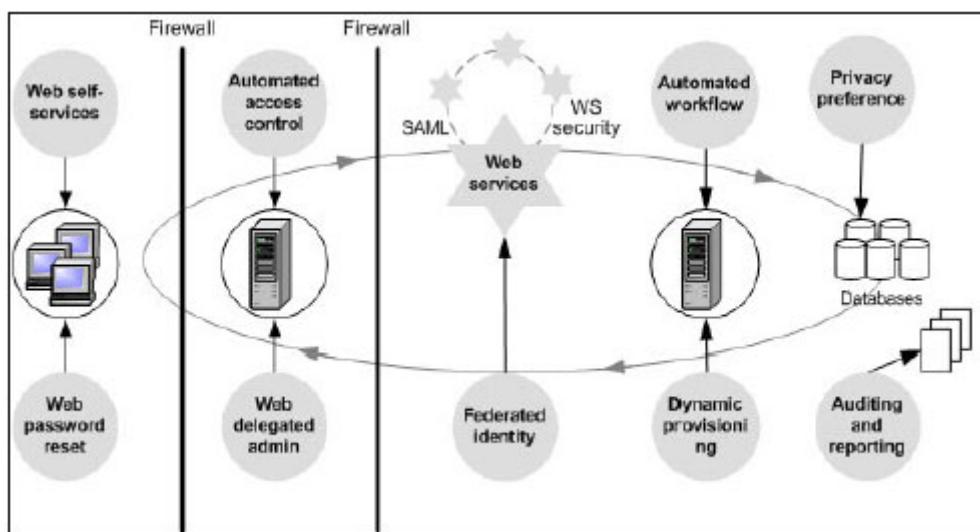


Figure 11-29 Capabilities of an identity management solution

Products that should be evaluated in developing a solution using this approach include Tivoli Identity Manager, Tivoli Access Manager for Business Integration, for On Demand Business, for Operating Systems, Tivoli Privacy Manager, Tivoli Directory Server, Tivoli Directory Integrator, WebSEAL and Policy Server, WSAS Network Deployment, Web Portal Manager, and WebSphere MQ.

How to provide scalable and consistent management and control of operations for end to end business systems

System failures and poor performance can diminish employee productivity, reduce client satisfaction, and possibly even lose clients. The key to avoiding such failures and maintaining peak performance lies in diagnosing and resolving issues quickly before they become serious problems. Highly interconnected systems often make this diagnosis difficult, inefficient, and expensive. A failure in a single component, such as a router, can quickly cause entire business systems to fail, generating many symptomatic alerts from multiple downstream components. The resulting confusion can cause wasted time and effort.

Business processes and operations are linked across the entire company from people all the way through the IT infrastructure. However, traditional system management tools only focus on a particular component while the linkage between all components and the business impact of a particular component failure is not easily and quickly revealed. Enterprises need capabilities that provide end-to-end visibility for management and control operations encompassing the IT infrastructure as well as business processes. Single point management and control operations can provide cost savings and other efficiencies that make the enterprise more responsive.

Products that should be evaluated in developing a solution using this approach include Tivoli Access Manager for Business Integration, Tivoli Risk Manager, Tivoli Enterprise Console, Tivoli Monitoring, Tivoli Comprehensive Network Address Translator, Tivoli Think Dynamic Orchestrator, Tivoli System Automation, Tivoli Decision Support, Report Management Facility component of z/OS®, Workload Manager for z/OS, Grid Toolbox, Electronic Service Agent™, Tivoli Storage Manager, Tivoli Storage Resource Manager, Tivoli Storage Area Network Manager, Multiple Device Manager, and Autonomic Computing Toolkit.

How to avoid system failures and take automated action to resolve problems

The IT environment relies on a large number of systems with an increasing amount of resources, such as processors, memory banks, hard drives, cables, switches, and so on. Even if the progress in technology allows all those components to be more and more reliable, failures will still occur.

The On Demand Operating Environment needs to anticipate problems and enable automated policy-based approaches to problem resolution. The overall objective and purpose of availability management is to provide a policy-based declaration of level of resiliency for a deployed solution.

The capabilities of the On Demand Operating Environment will be exploited to predict and monitor failures in the system, and to preempt, fix, react, and respond to those failures and degradations. Actions may range from a simple fix for a failure, to more complex schemes for redistribution of workload away from failed systems, or even extreme actions that move or re-deploy the entire underlying infrastructure to meet availability requirements. Tooling and services are required to understand the resource composition of an operating environment in order to re-provision those resources.

Products that should be evaluated in developing a solution using this approach include Tivoli Monitoring, Tivoli Business Systems Manager, Tivoli Enterprise Console, Tivoli System Automation for Linux or OS/390®, Tivoli Think Dynamic Orchestrator, Geographically Dispersed Parallel Sysplex™, and Tivoli Storage Network Area Manager.

How to protect systems from intrusions and threats using monitor and alert systems

In today's complex network environment, On Demand Business enables significant transactions to take place online, both business-to-business (B2B) and business-to-consumers (B2C), with varying levels of trust and knowledge about each other. Business face increasing risks from a multitude of fronts such as virus threats, unauthorized access, denial of service attacks, and so on, that target networks, servers, and desktops. The risks increase as more enterprise systems and applications become accessible on the Internet. On Demand Business has created an environment in which a technical attack can translate directly into legal liability if confidential information is exposed, a drop of client confidence due to a downed site or exposed information, loss of income, and even a loss of brand equity. The most important concern is how to let the good guys in and keep the bad guys out.

Companies have made significant investments in many key products, such as firewalls, intrusion detection systems, and application-level security, mainly because each key product implements a specific security function that is required to implement the overall security strategy. However, security is more than a firewall or other product solution. An integrated security management solution enables corporations to make the most informed security decisions by leveraging the intelligence of the various security links. Centrally correlating intrusions and vulnerabilities across different components provides the overall assurance that

individual security components reinforce and complement each other and implement the overall business goal of managing risks to information assets.

Products that should be evaluated in developing a solution using this approach include Tivoli Intrusion Manager, Tivoli Risk Manager, Tivoli Security Event Management, Tivoli Enterprise Console, and z/OS Intrusion Detection Services Functions.

How to monitor systems to allow establishment of business SLAs and automate detection and remediation of violations

Information technology departments are typically accountable for the service they provide for the lines of business. IT managers and line of business managers generally use service level agreements to ensure business objectives are met.

IT departments often manage service levels from multiple lines of business in a complex environment across countries and regions, over thousands of machines running on heterogeneous platforms. Without effective management tools, IT departments must use manual efforts to provide and report their services.

Reporting on SLAs is always a time consuming and labor-intensive process. It requires manual comparison between data on multiple IT infrastructures and the client's SLAs. In addition, the IT personnel compiling reports have to deal with many different tools and consoles to find the state of resources and the business processes they affect.

Line of business managers want to know the status of the service level that may affect their business. They are not interested in the individual components of the IT infrastructure. However, that is exactly what traditional systems management tools focus on: servers, routers, applications, disk space, and so on. They do not show which problem has the highest business priority or what areas of the business are affected if a particular component is down or performing poorly.

Service Level Management (SLM) is an iterative process that involves identifying a business process, providing services upon which the business process depends, and defining the parameters and agents to measure the process. It is the discipline of measuring, reporting, and managing the quality of a service supplied to the business; it involves negotiating the service level agreement, monitoring the business process, fine-tuning business practices and infrastructure, and delivering increasingly better service.

Products that should be evaluated in developing a solution using this approach include Tivoli Business Systems Manager, Tivoli Systems Manager for z/OS, Tivoli Service Level Advisor, Tivoli Website Analyzer, RMF™ Component of z/OS, WLM for z/OS, and Tivoli System Automation for OS/390.

How to reduce the time and cost to re-purpose IT resources to meet business requirements

In today's business environment, companies are constantly under pressure to control or cut costs. On demand is a strategy that can be applied to realize benefits and value across the entire enterprise. It is not something that needs to be focused only on production applications and resources. Companies can achieve savings and value by exploiting On Demand Business to re-purpose IT resources for other areas of the business.

One important characteristic of an On Demand Operating Environment is its ability to adapt and configure itself to changes in the infrastructure, with minimal human intervention, based on goals and policies specified by the offering or provider administrator. Triggers that drive configuration changes in an On Demand Operating Environment can include administrator's requests to allocate/de-allocate or reconfigure resources; requests from other autonomic managers (for example, a workload manager, availability manager, and so on) to

allocate/de-allocate resources or reconfigure resources supporting an already running service; and dynamically detected configuration changes that have implications to other resources or other resource managers.

In all of these cases, the actual changes that need to be made to the environment could range from simple changes (which involve the execution of a single command), to more complex changes that need to be orchestrated across multiple resources and resource managers. Typically, such configuration changes tend to be labor-intensive and error-prone tasks that require documentation of and adherence to complex change-management processes.

This approach is about providing adaptable capabilities to automate the management of IT resources, including rapid, error-free, and less labor-intensive re-purposing of IT infrastructure elements to meet business and application requirements.

Products that should be evaluated in developing a solution using this approach include Tivoli Think Dynamic Orchestrator, Tivoli Provisioning Manager, Tivoli SAN Manager, Tivoli Storage Resource Manager, Grid Toolbox, zSeries processors with LPAR, z/VM and Linux for zSeries, and Enterprise Workload Management.

How to map the IT resources used by various business processes of an end-to-end solution

Organizations need a complete solution that helps IT specialists efficiently track assets from a financial, contractual, and usage point of view. An integrated view of its software assets can help an organization effectively plan for maintenance and upgrades and understand precisely which resources are needed to support their business.

Similarly, an understanding of the components that make up a solution, and their relationships, is critical to managing the solution in its entirety as well as managing the various components in the context of the solution (versus managing them as independent elements).

This understanding allows the decomposition of the performance of a solution into various tiers. An autonomic manager can then invoke appropriate configuration changes or provision additional resources to where they will have the most impact towards meeting service level agreements and business objectives.

Products that should be evaluated in developing a solution using this approach include Tivoli Configuration Manager and Tivoli License Manager.

How to consolidate and simplify the IT infrastructure

Systems consolidation is more than replacing many smaller servers with a few larger servers. It is about simplifying and optimizing existing end-to-end IT infrastructures, including servers, storage, databases, applications, networks, and systems management processes. The goal is to reduce both cost and complexity. Consolidation also provides a more efficient and stable foundation for growth and new solution development, which makes it the logical first step toward deploying an On Demand Operating Environment.

Dynamic provisioning is another technology that enables consolidation of servers by allowing them to be shared across workloads, driving up utilization and allowing for a reduction of the number of servers and storage systems.

There are several methods of consolidation that can be implemented individually or in combination:

- ▶ Centralization co-locates physical servers and storage into fewer locations to reduce the number of physical sites.
- ▶ Physical consolidation combines similar server and storage resources into larger, more powerful systems, while typically maintaining the same application platform.
- ▶ Data consolidation combines data with different formats into a similar format or platform.
- ▶ Workload consolidation involves consolidating servers supporting different types of workloads onto fewer or larger systems.

Consolidation allows companies to leverage IT for added business value. As IT reduces complexity and simplifies systems management, total cost of ownership (TCO) dramatically improves. Part of the TCO improvement comes from the ability to reduce and eliminate redundancy in the infrastructure and gain new efficiencies for the business that help to maximize revenue per client. As the infrastructure realizes improvements in availability, recoverability, performance, and scalability, the business can respond more quickly to new challenges and provide better service to clients, employees, suppliers, and partners. Through this consolidation, specific efficiencies may be realized, such as freeing up support staff to perform other tasks and reducing space and energy requirements.

Products that should be evaluated in developing a solution using this approach include Tivoli SAN Manager, TotalStorage FASTT, Enterprise Storage Server, Virtual Tape Server, Network Attached Storage 100/200, Linear Tape Open, and IBM @server xSeries (VMware), pSeries, iSeries, zSeries (zVM, Linux), and BladeCenter.

How to optimize utilization and pool resources across a heterogeneous environment

IT organizations today have business applications that are multi-tiered and heterogeneous. Transactions and units of work supporting the business span multiple servers and systems. While faced with these types of environments, IT organizations within every industry are being challenged with reducing costs for IT resources as well as for reducing the amount of skilled labor to manage them, all of this while staying focused on ensuring that IT provides the resources needed to support the business.

To address the need to reduce costs, IT organizations must optimize their IT resources at higher utilization rates to achieve a better return on their investment. Doing this with today's heterogeneous infrastructures can be a challenge.

In addition to being able to optimize the resource, the needs of the business must also be considered. Additional workload cannot be randomly sent to servers that have lower utilization rates since those servers may be positioned to handle a planned peak demand at a certain point in time. To guard against this happening, utilization optimization must be tied to the established policies regarding business application performance and service level objectives. The objective is to optimize in order to reduce costs, while at the same time maintaining the service levels required to support the needs of the business.

Products that should be evaluated in developing a solution using this approach include Intelligent Resource Director, Total Storage Virtualization, Total Storage SAN Volume Controller, zSeries with Intelligent Resource Director, z/OS WLM, Grid Toolbox, and Grid Offering for Risk Management.

How to provision system resources to meet business demands

Provisioning in an On Demand Operating Environment is the ability to automatically deploy and dynamically optimize operational resources in response to business objectives in a heterogeneous environment. There are many types of resources that may be provisioned: servers, storage, identities, applications, networks, and more.

When platform provisioning technologies are combined with other provisioning technologies and enhanced by orchestration, the On Demand Operating Environment will have the ability to make the most informed decisions about provisioning hardware, software, applications, and so on to optimize the IT infrastructure.

Businesses need to be able to address the following requirements:

- ▶ Quickly deploy new N-tier applications and all of the resources that support them to stay responsive and competitive.
- ▶ Support a heterogeneous environment, with multiple hardware platforms, operating systems, and software and middleware components.
- ▶ Reduce administrative costs associated with deployments through the use of automation.
- ▶ Increase system utilization by quickly and reliably re-provisioning systems to meet immediate business requirements, including service level objectives.
- ▶ Make the underlying hardware and OS platforms as transparent to the applications, business processes, and users as possible.

General strategy

The components needed to implement this approach have to respect the general attributes of an On Demand Operating Environment. Specifically, they must be:

Self-managing: To reduce the administrative overhead associated with provisioning systems and to reduce human error, the provisioning process should be as automated as possible and self-managing. This implies the use of autonomic technologies to sense when systems need to be re-provisioned, and taking advantage of automated workflows to carry out the re-provisioning steps.

Scalable: Solutions need to be scalable to be able to address the provisioning of systems across large server farms and cluster environments. As companies merge with one another, an On Demand Operating Environment would allow for the integration of new systems and applications, and also enable the re-provisioning of systems that may no longer be required due to redundancy. Provisioning solutions that take advantage of the existing provisioning technologies provided with many hardware and software platforms are inherently scalable to some extent, by having the capability to offload some of the work to the individual platform.

Resilient: A provisioning solution can be a major enabler of a resilient environment by allowing for quick provisioning of systems to recover from catastrophic failures. But the provisioning system itself must also be resilient, able to recover from errors during the provisioning process.

Economical: Any solution today needs to be economical, and a provisioning solution is no different. A centralized solution that addresses multiple platforms and takes advantage of the unique facilities provided by some of those platforms takes advantage of economies of scale. In addition, it reduces the administrative overhead.

Open standards-based: The only way that a centralized solution can provide consistent provisioning to a large number of platforms, operating systems, applications, and data stores is by building on and using open standards.

As a solution sample, Figure 11-30 shows a data center orchestrated provisioning based on Tivoli Intelligent Think Dynamic Orchestrator. Tivoli Intelligent ThinkDynamic Orchestrator operates in a closed loop that performs automatic resource requirements prediction, based on predefined service level objectives and agreements, and automates infrastructure deployment. This cycle ensures each application has the resources it needs, when it needs them, without static over provisioning.

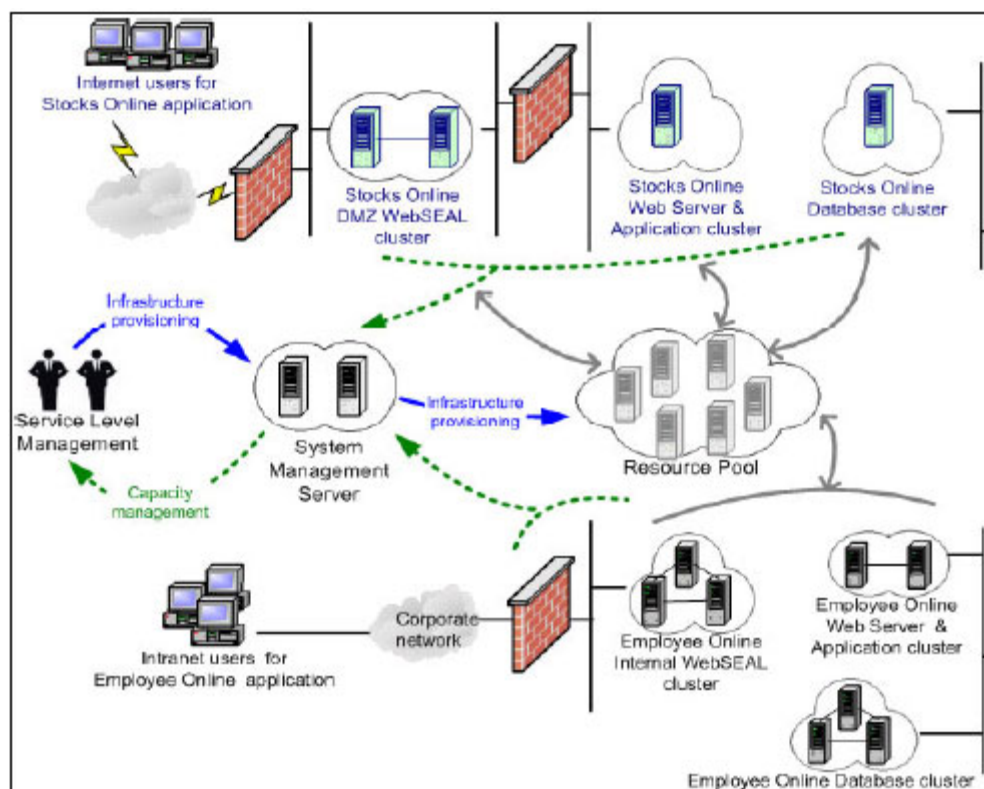


Figure 11-30 A data center orchestrated provisioning based on Tivoli Intelligent Think Dynamic Orchestrator

Products that should be evaluated in developing a solution using this approach include Tivoli Think Dynamic Orchestrator, Tivoli Provisioning Manager, Tivoli Monitoring, Tivoli Monitoring for Web Infrastructure, Tivoli Monitoring for Databases, Tivoli Storage Manager Extended Edition, Tivoli Storage Manager for Application Servers, Director, Server Allocation for WAS, Remote Deployment Manager, WebSphere Application Server Network Dispatcher, Tivoli Management Region Server, BladeCenters, xSeries, and Storage.

11.7 Virtualization engine as a solution building block / standardized bundle

Together with the Business Solutions and the Infrastructure Solutions, the IBM portfolio of solution offerings includes Solution Building Blocks and Standardized Bundles.

The Solution Building Blocks are preconfigured bundles that enable larger business or infrastructure solutions, but require additional integration (not included). The Standardized Bundles are offerings of products and services packaged as standardized bundles that solve an immediate need without seeking to transform client business. The following section is a description of Virtualization Engine as a Solution Building Block/Standardized Bundle.

11.7.1 Virtualization engine overview

With the IBM Virtualization Engine, you can manage infrastructure complexity, improve IT utilization, simplify management and reduce costs, and also deliver On Demand Business.

Manage infrastructure complexity

The IT simplification is about reducing costs and complexity, and also about improving reliability and prioritizing IT and business decisions so that they better support the business. The virtualization solutions can:

- ▶ Lower the cost of an existing infrastructure
- ▶ Reduce the complexity of managing the infrastructure
- ▶ Enhance the flexibility of the infrastructure

IBM Virtualization Engine is a comprehensive portfolio of systems technologies and tools that can help you aggregate pools of resources and get a consolidated view of them throughout your IT environment. It uses key IBM virtualization technologies to give you a logical, rather than physical, view of data, computing power, storage capacity, and other resources.

Virtualization Engine can help you automate the management of these resources based on your business goals and make basic systems management of multiple disparate systems possible.

With the IBM Virtualization Engine, you can start to put in place the technology that enables real-time, dynamic deployment and optimization of IT resources. Its open standards-based approach allows you to manage all your systems from a single, easy-to-use “dashboard.”

Improve IT utilization

Virtualization Engine can:

- ▶ Increase utilization of system resources, thereby reducing IT proliferation
- ▶ Broaden access to resources, helping to give people access to the information and applications they need, when they need them
- ▶ Increase application availability to help operational speed and business responsiveness
- ▶ Leverage flexible technologies for your changing business needs

Virtualization Engine helps optimize both IBM systems and IBM TotalStorage systems across your organization.

Because it can provide world-class virtualization functions across platforms (IBM systems and select others), it can enable simplified management of resources across a truly heterogeneous infrastructure.

IBM Virtualization Engine's optimization, provisioning, and systems management functionality can be leveraged for one server or extended to all enabled IBM and TotalStorage systems across your entire enterprise.

By monitoring workloads across your infrastructure, the Enterprise Workload Manager (EWLM) component of Virtualization Engine can give you the ability to better utilize IT resources by helping increase utilization of existing systems and by employing EWLM-enabled routers that can direct workloads to resources programmed to meet service goals.

EWLM can encompass a broad heterogeneous infrastructure, including network resources. Alternatively, you can deploy EWLM to only handle subsets of your IT infrastructure, depending on your current technology requirements.

Simplify management and reduce costs

Virtualization Engine provides a comprehensive set of services and technologies that can help you achieve your goals by aggregating pools of computing resources into a single, logical view. This can help to streamline IT administration, lower costs, and free skilled IT staff to work on other tasks.

A key enabler of simplification is consolidated systems management, which allows you to use a Web-based interface to perform core systems management functions in a multiple IBM server and OS environment. Managing your systems in a consistent way can help reduce your organization's total cost of ownership (TCO).

Using an open standards base as its framework, consolidated systems management (delivered through IBM Director Multiplatform and the IBM Virtualization Engine console) makes it easier to implement a solution that works across multiple IBM platforms, helping you integrate third-party products and smoothly migrate to advanced autonomic and On Demand Business features while leveraging existing management investments.

Deliver On Demand Business

Virtualization Engine is a set of technologies and management services that work together to bind the fabric of the individual systems into a cohesive environment. It is the centerpiece of solutions for virtualization from IBM.

Virtualization Engine can help you deliver the promise of On Demand Business to your company by simplifying infrastructure complexity using systems management and tools to improve resource utilization and provisioning resources across operating systems, servers, and storage platforms.

This unique combination of capabilities and functions thereby helps to reduce the complexity, costs, and efforts associated with a heterogeneous IT environment.

The IBM Virtualization Engine can help you create a nimble IT infrastructure, capable of shifting priorities, balancing growth, and addressing service levels to respond to changing business requirements in real time. It is a key step toward making your business an on demand one.

11.7.2 Virtualization engine offerings

The flexible mix of systems technologies (delivered through the IBM Virtualization Engine for Systems) and systems tools (delivered to enterprises as the IBM Virtualization Engine Suite for Servers) of the IBM Virtualization Engine, optimize computing resources and integrate technology and business processes.

Virtualization engine for systems

To help speed implementation, the IBM Virtualization Engine leverages leading IBM technologies. These technologies are integrated and delivered with certain IBM systems, including pSeries, iSeries, and zSeries. The technologies include:

- ▶ Hypervisor: Supports partitioning and dynamic resource movement across multiple operating system environments
- ▶ VLAN: Helps provide network virtualization capabilities that allow you to prioritize traffic on shared networks

- Virtual I/O: Helps provide the ability to dedicate I/O adaptors and devices to a virtual server, allowing the on demand allocation and management of I/O devices

To facilitate similar virtualization capabilities and functions in IBM @server xSeries and BladeCenter systems, you can use products from third-party vendors, such as VMware and Microsoft Virtual Server.

For p5 and pSeries

IBM @server p5 servers utilize IBM Virtualization Engine for Systems technology options that open the doors to exciting new possibilities for IT simplification. Innovations in the IBM @server p5 product line set the standard for systems utilization, management, and flexibility.

Table 11-8 shows the p5 and pSeries VE for Systems key technologies.

Table 11-8 p5 and pSeries VE for Systems key technologies

Technology	Description
DLPAR	Dynamic logical partitioning increases flexibility, enabling selected system resources like processors, memory, and I/O components to be added and deleted from dedicated partitions while they are actively in use. The ability to reconfigure dynamic LPARs enables system administrators to dynamically redefine available system resources to reach optimum capacity for each partition
Micro-Partitioning	The POWER5 processor introduces an enhanced partitioning model based on established mainframe technologies and LPAR/ DLPAR implementations on POWER4™ and POWER4+™ servers. Micro-Partitioning enables the virtualization of system resources on an extremely granular level. In POWER5 processor-based systems, physical resources can be abstracted into virtual resources that are available to partitions. Resources can be shared easily, and changes in resource allocation are transparent to users.
PLM	The Partition Load Manager provides automated processor and memory distribution between dynamic LPARs and Micro-Partition-capable LPARs running AIX 5L™. The PLM application is based on a client/server model for the sharing of system information, such as processor or memory events, across concurrent present LPARs.

Technology	Description
Virtual I/O	The Virtual I/O Server is a special-purpose partition that provides virtual I/O resources to client partitions. The Virtual I/O Server owns the resources that are shared with clients. A physical adapter assigned to a partition can be shared by one or more other partitions, enabling administrators to minimize the number of physical adapters they require for individual clients. The Virtual I/O Server can thus reduce costs by eliminating the need for dedicated network adapters, disk adapters, and disk drives.
Virtual Ethernet	Without requiring any additional hardware, the POWER5-based p5 systems provide high-speed Virtual Ethernet communication paths between multiple operating systems, such as AIX 5L and Linux. Virtual Ethernet segments can be dynamically created and access to a virtual LAN segment can be restricted for security or traffic segregation

For iSeries

Virtualization is delivered natively in IBM @server iSeries servers. IBM Virtualization Engine for Systems technologies can be used to help simplify your IT infrastructure without disruption. You are then able to focus on continued business innovation and growth.

Table 11-9 shows the iSeries VE for Systems key technologies.

Table 11-9 Series VE for Systems key technologies

Technology	Description
DLPAR	Dynamic logical partitioning increases flexibility, enabling selected system resources like processors, memory, and I/O components to be added and deleted from dedicated partitions while they are actively in use. The ability to reconfigure dynamic LPARs enables system administrators to dynamically redefine all available system resources to reach optimum capacity for each partition.
Micro-Partitioning	The POWER5 processor introduces an enhanced partitioning model based on established mainframe technologies and LPAR/ DLPAR implementations on POWER4 and POWER4+ servers. Micro-Partitioning enables the virtualization of system resources on an extremely granular level. In POWER5 processor-based systems, physical resources can be abstracted into virtual resources that are available to partitions. Resources can be shared easily, and changes in resource allocation are transparent to users.

Technology	Description
IBM Director Multiplatform	IBM Director Multiplatform enables monitoring and event management across a heterogeneous IT environment, including Windows, Intel, AIX, OS/400®, and Linux, from a single Java-based user interface. From one access point, you can monitor system resources, inventory, events, task management, core corrective actions, distributed commands, and hardware control for your servers and storage.
IBM Virtualization Engine Console	Many editions of iSeries and i5 servers feature the Virtualization Engine console. The console is based on the IBM Integrated Solutions Console framework to provide a consolidated view for managing your virtualized enterprise resources. The Virtualization Engine console works with IBM Director Multiplatform to present a comprehensive view of individual platforms.
Virtual Ethernet	Without requiring any additional hardware, the POWER5-based iSeries systems provide 1Gb Virtual Ethernet communication paths between multiple operating systems, such as i5/OS™, Linux, and AIX 5L. Virtual Ethernet segments can be dynamically created and access to a virtual LAN segment can be restricted for security or traffic segregation requirements.
Virtual I/O	The Virtual I/O Server is a special-purpose partition that provides virtual I/O resources to client partitions. The Virtual I/O Server owns the resources that are shared with clients. A physical adapter assigned to a partition can be shared by one or more other partitions, enabling administrators to minimize the number of physical adapters they require for individual clients. The Virtual I/O Server can thus reduce costs by eliminating the need for dedicated network adapters, disk adapters, and disk drives.

For zSeries

IBM @server zSeries servers utilize IBM Virtualization Engine for Systems technologies to place zSeries at the hub of a powerful, optimized infrastructure fabric.

Table 11-10 shows the zSeries VE for Systems key technologies.

Table 11-10 zSeries VE for Systems key technologies

Technology	Description
DLPAR	Dynamic logical partitioning increases flexibility, enabling selected system resources like processors, memory, and I/O components to be added and deleted from dedicated partitions while they are actively in use. The ability to reconfigure dynamic LPARs enables system administrators to dynamically redefine all available system resources to reach optimum capacity for each partition

Technology	Description
HiperSockets™	HiperSockets is a totally integrated, any-to-any, virtual TCP/IP network that provides benefits not achievable by grouping servers around a mainframe interconnected by external networking technology. HiperSockets can provide the ever-available, high speed network connection among multiple combinations of virtual servers and LPARs running Linux on zSeries, Linux on S/390®, z/OS V1R2, z/VM V4R2, and VSE/ESA™ V2R7 or later on zSeries.
Intelligent Resource Director	The Intelligent Resource Director (IRD), introduced as part of the IBM @server zSeries and z/OS, is designed to give your installation an enhanced ability to dynamically move resources to your most important work. IRD can help you handle unexpected workload spikes and improve your system's efficiency and availability. It also can help reduce the systems management skills and time required to define the I/O configuration.
Parallel Sysplex clustering	Running a zSeries Parallel Sysplex can help to simplify a distributed environment by running the transaction volumes on a single unified processing base with the associated benefits of zSeries availability, and so on. The Parallel Sysplex ability to support very large databases with integrity and high performance can help simplify those environments, which have to partition data across multiple servers. This can help increase availability while reducing administrative and management costs.
Virtual I/O	The Virtual I/O Server is a special-purpose partition that provides virtual I/O resources to client partitions. The Virtual I/O Server owns the resources that are shared with clients. A physical adapter assigned to a partition can be shared by one or more other partitions, enabling administrators to minimize the number of physical adapters they require for individual clients. The Virtual I/O Server can thus reduce costs by eliminating the need for dedicated network adapters, disk adapters and disk drives
VLAN	Configured through software, rather than hardware, a Virtual Local Area Network (VLAN) allows computers to behave as if they are located on the same segment of a Local Area Network (LAN), even though they may be physically located on different segments. Extremely flexible VLANs help provide virtualization capabilities because they allow you to prioritize traffic on shared networks. A VLAN is organized by traffic patterns rather than physical location

Technology	Description
zAAP	With the zSeries Application Assist Processor (zAAP) available on the IBM @server zSeries 890 (z890) and IBM @server zSeries 990 (z990) servers, users can deploy and integrate new Java technology-based workloads on the very same platform as heritage applications and core business databases in a highly cost-effective manner.

For xSeries and BladeCenter

IBM Virtualization Engine for Systems technologies, and products from third-party vendors, help simplify your IT infrastructure without disruption. IBM Virtualization Engine allows you to focus your IBM @server xSeries and BladeCenter environment on continued business innovation and growth.

Table 11-11 shows the xSeries and Blade Center VE for Systems key technologies.

Table 11-11 xSeries and Blade Center VE for Systems key technologies

Technology	Description
IBM Director	IBM Director enables monitoring and event management across a heterogeneous IT environment, including Intel, Windows, Linux, AIX and OS/400, from a single Java-based user interface. From one access point, you can monitor system resources, inventory, events, task management, core corrective actions, distributed commands, and hardware control for your servers and storage.
Virtual Machine Manager	IBM Virtual Machine Manager (VMM) is an extension to IBM Director that allows you to manage both physical and virtual machines from a single console. With VMM, you can manage both VMware ESX Server and Microsoft Virtual Server environments using IBM Director. VMM also integrates VMware VirtualCenter and IBM Director for advanced virtual machine management
VMware	Server partitioning software designed for server consolidation, rapid deployment of new servers, availability, and simplified management—helping to improve hardware utilization, save space, IT staffing, and hardware costs.

Virtualization Engine for Enterprise

For the enterprise, IBM Virtualization Engine provides a collection of multiplatform system tools that help:

- ▶ Simplify management and utilization of IT resources
- ▶ Allow IT infrastructures to support business process change

Figure 11-31 on page 218 shows a simple illustration of the benefit of Managed Virtualization.

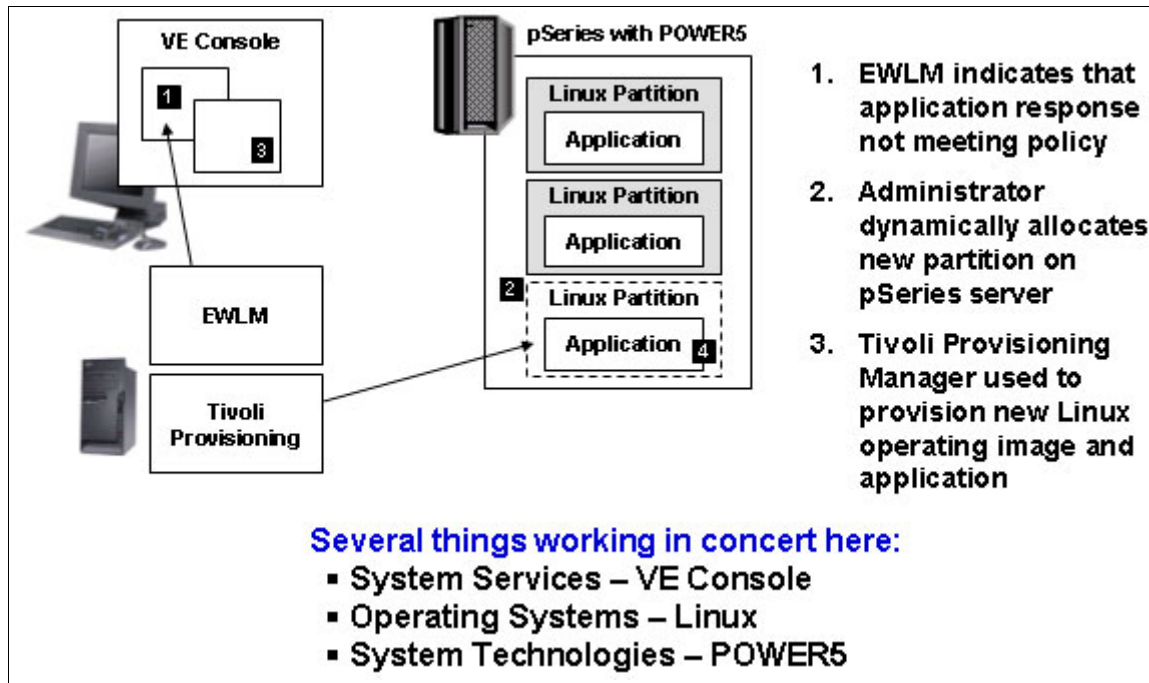


Figure 11-31 The benefit of managed virtualization

IBM Enterprise Workload Manager

The IBM Enterprise Workload Manager (EWLM) enables you to automatically monitor multi-tiered, distributed, heterogeneous, or homogeneous workloads across an IT infrastructure to better achieve defined business goals for end-user services. These capabilities allow you to:

- ▶ Identify work requests based on service class definitions
- ▶ Track performance of those requests across server and subsystem boundaries
- ▶ Redirect work, using EWLM-enabled routers, to achieve specific performance goals for each service class

By bringing this self-tuning technology to the set of servers, routers, and other devices enabled with Java virtual machine support, EWLM can help enable greater levels of performance management for distributed systems.

Figure 11-32 on page 219 shows the EWLM functionality.

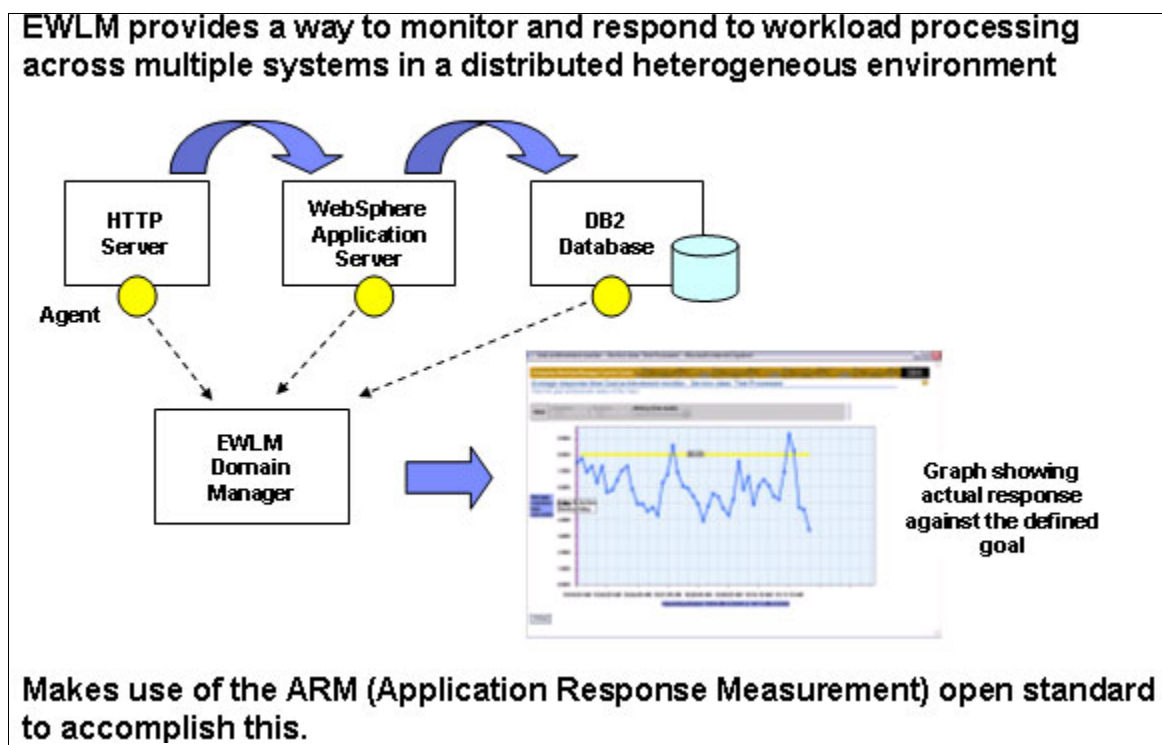


Figure 11-32 EWLM functionality

EWLM provides goal-based, end-to-end performance monitoring of an application. It also influences network traffic routing decisions by network load balancers for improved application performance and server effectiveness.

Using EWLM, a system administrator can monitor multiple servers and answer such questions as:

- ▶ How is the work progressing?
- ▶ Are the business commitments for end-user service being met?
- ▶ If not, which components of which servers are causing the problem?
- ▶ What user type are affected?

System administrator can also use EWLM to:

- ▶ Specify a performance goal that applies to each class of user of a distributed application
- ▶ Identify where time is spent in a distributed application that spans different operating systems, applications, networks and routers
- ▶ Identify which servers are actively supporting a given application and what applications are running on a given server

IBM Director Multiplatform

IBM Director Multiplatform helps deliver a common, consistent, cross-platform systems management solution for IBM servers, storage, and operating systems. It provides a single administrative console for management tasks (operating system, storage management, distributed systems management, and platform management), a common management infrastructure for upward integration with Tivoli, and a management foundation for the On Demand Business architecture. Using IBM Director Multiplatform, many of the administrator's manual tasks can be automated to proactively and remotely manage systems.

Table 11-12 shows Director Multiplatform tasks and description.

Table 11-12 Director Multiplatform Tasks and description

Task	Description
Discovery	Discovery of managed systems.
Inventory	View SW inventory and container inventory of systems and groups.
Monitors	Define and view resource monitors for systems and groups and set thresholds.
Event Log	View Director events written to event log by respective event action plans.
Process Manager	View, start, stop, and monitor processes; execute commands and schedule tasks.
Remote Session	Establish command line sessions (for example, telnet) with remote system.
File Transfer	Transfer and directory management on systems and groups.
CIM Browser	View and modify CIM data and execute CIM methods.
SNMP Browser	View SNMP information and set SNMP attributes.
Task Scheduler	Schedule and monitor non-interactive management tasks.
Hardware Control	Start, stop, reset, and so on.

Additionally, the predictive and proactive capabilities associated with alerting and real-time system diagnostics help maximize server uptime and reduce service downtime costs. IBM Director Multiplatform also provides a bridge to the IBM Virtualization Engine console. This bridge enables uses of the Virtualization Engine console health center to monitor and take some corrective actions from a task-oriented, Web-based interface

Figure 11-33 on page 221 shows the Director Multiplatform functionality.

Director Multiplatform

A converged and consistent hardware systems management solution that is integrated into the VE Console framework

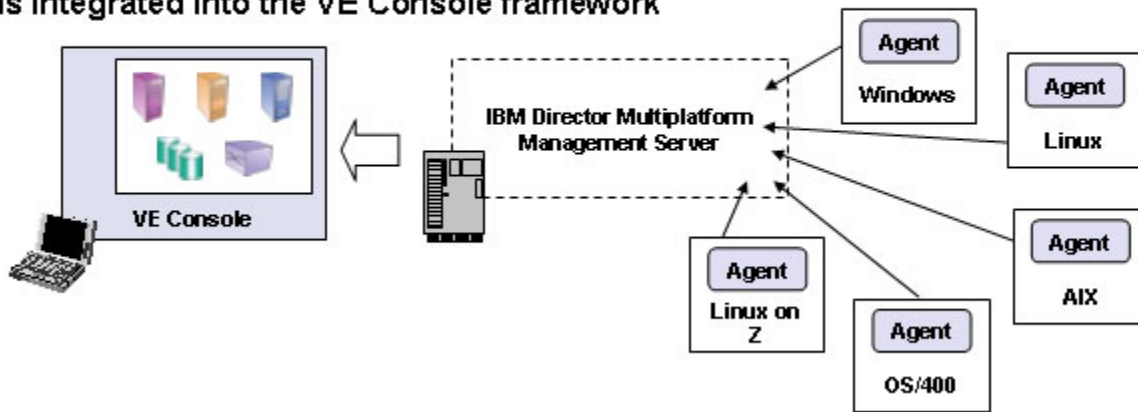


Figure 11-33 The Director Multiplatform functionality

IBM Tivoli Provisioning Manager

IBM Tivoli Provisioning Manager automates the manual tasks of provisioning and configuring servers, operating systems, middleware, applications, storage, and network devices. Through the use of automation workflows, TPM automates the manual provisioning and deployment process. It uses pre-built “industry best practice” workflows to provide control and configuration of the products of major vendors. You can also create customized workflows to implement the best practices and procedures of your company's data center. These procedures can then be automated and executed in a consistent error-free manner. In fact, using these automation workflows, TPM has the ability to provision and deploy a server (from bare metal to full production). These workflows could be defined so that the process of defining the resources within a server could be started with a single push of a button.

TPM introduces the concept of a pool of resources that are shared between different workloads. The provisioned pool, a logical view of the available resources, can thus be viewed as a virtual pool.

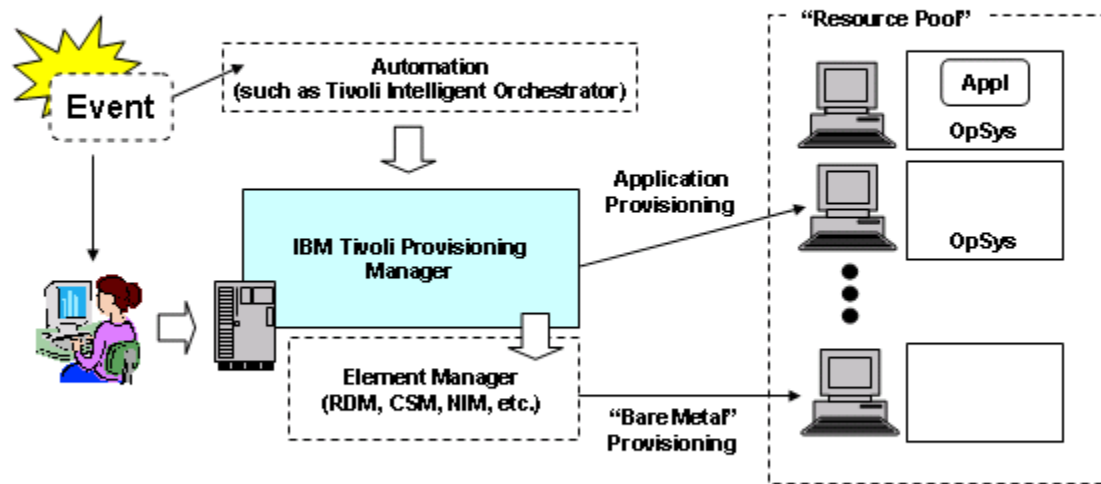
Provisioning of systems is a sequence of activities that must happen in a specific order. Typical activities include:

- ▶ Installing operating systems
- ▶ Remotely booting networks
- ▶ Configuring networks such as Virtual Private Networks (VPN) and storage environments like Storage Area Network (SAN) or Network Attached Storage (NAS)
- ▶ De-provisioning resources back into an available pool

Figure 11-34 on page 222 shows System Provisioning with TPM.

System Provisioning

A way to provide configured resource on an “as needed” basis, based on events occurring within your environment



Dynamic and potentially automatic movement of compute resources into and out of use.

Figure 11-34 System provisioning with TPM

IBM Grid Toolbox for Multiplatform

IBM Grid Toolbox V3 for Multiplatforms, based on the Globus Toolkit V3.0 and the Open Grid Services Architecture (OGSA), delivers the infrastructure to help rapidly develop, deploy, and manage distributed resources. Grid Toolbox V3 uses a service model approach for its architecture, which keeps the details of the implementation separate from the interface. As with any great architecture, you need a solid infrastructure: for grid computing, it is Open Grid Services Infrastructure (OGSI). OGSI delivers the infrastructure and runtime support on which all services that implement OGSA are based.

OGSI includes:

- ▶ Data management services: Provides efficient management and transfer of information.
- ▶ Resource management: Provides a single standard interface for requesting and using remote system resources for the execution of jobs.
- ▶ Information services: Provides critical information about grid resources for use in resource discovery, selection, and optimization. Service data can be created dynamically, and on demand.

The IBM Grid Toolbox V3 for Multiplatforms implements the OGSI standards and provides tools to build a grid and to develop, deploy, and manage grid services.

- ▶ The IBM Grid Toolbox consists of the following:
 - A hosting environment capable of running grid services and sharing them with other grid participants.
 - A set of tools to manage and administer grid services and the grid hosting environment, including a Web-based interface, the Grid Services Manager.

- A set of APIs and development tools to create and deploy new grid services and grid applications.

Note: The latest version of Globus Toolkit is V4.0.

IBM Virtualization Engine Console

The IBM Virtualization Engine console is based on the IBM Integrated Solutions Console framework to provide a consolidated view for managing your virtualized enterprise resources. The Virtualization Engine console works with IBM Director Multiplatform to present a comprehensive view of individual platforms.

The Virtualization Console provides two powerful cross-platform applications:

- ▶ Health center: Provides a single view point to perform key system and storage monitoring and management
- ▶ Launch-pad: Provides a single view to launch key Virtualization Engine related systems and storage management consoles.

Figure 11-35 shows Virtualization Engine Console functionality.

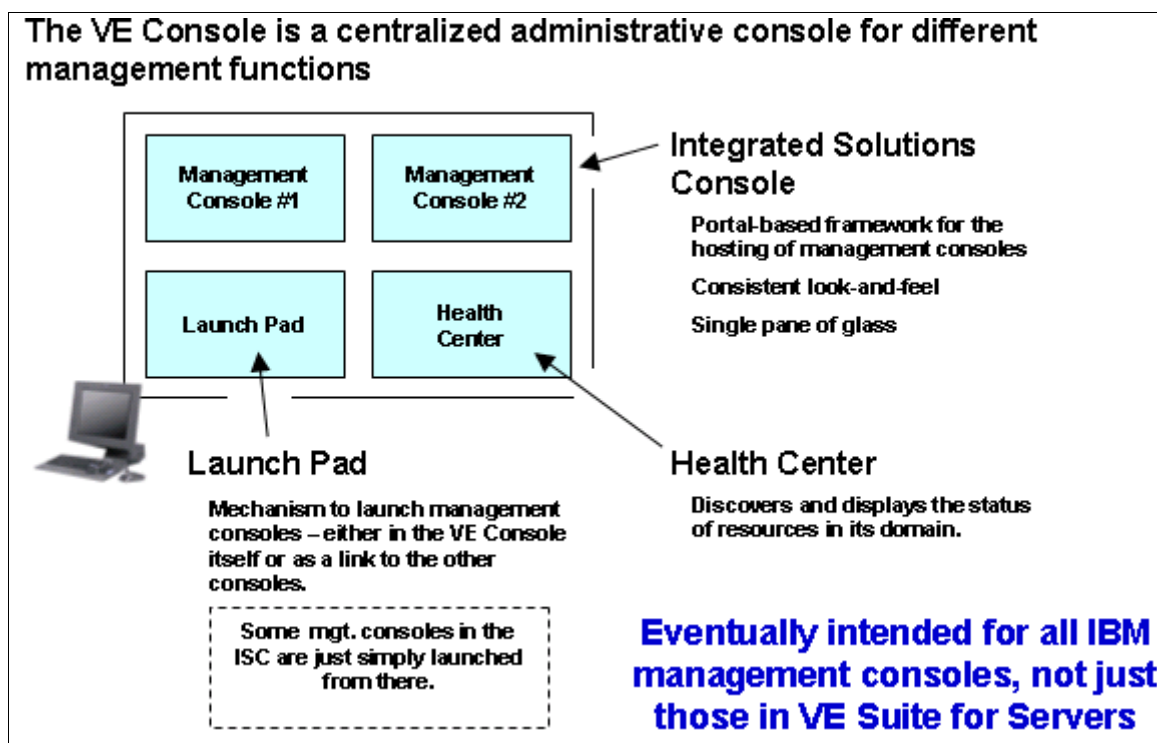


Figure 11-35 Virtualization Engine console functionality

IBM Dynamic Infrastructure Enterprise Edition for mySAP Business Suite

Dynamic Infrastructure is an IBM On Demand Business solution for a heterogeneous environment that can enable you to run SAP environments more efficiently by dynamic provisioning of SAP systems across IBM @server platforms. It provides automated, policy-based, and end-to-end management of resources, performance, availability, security, and accounting and metering information about resource consumption across heterogeneous systems, driven by service-level agreements (SLAs).

Figure 11-36 on page 224 shows the IBM Dynamic Infrastructure Solution Architecture.

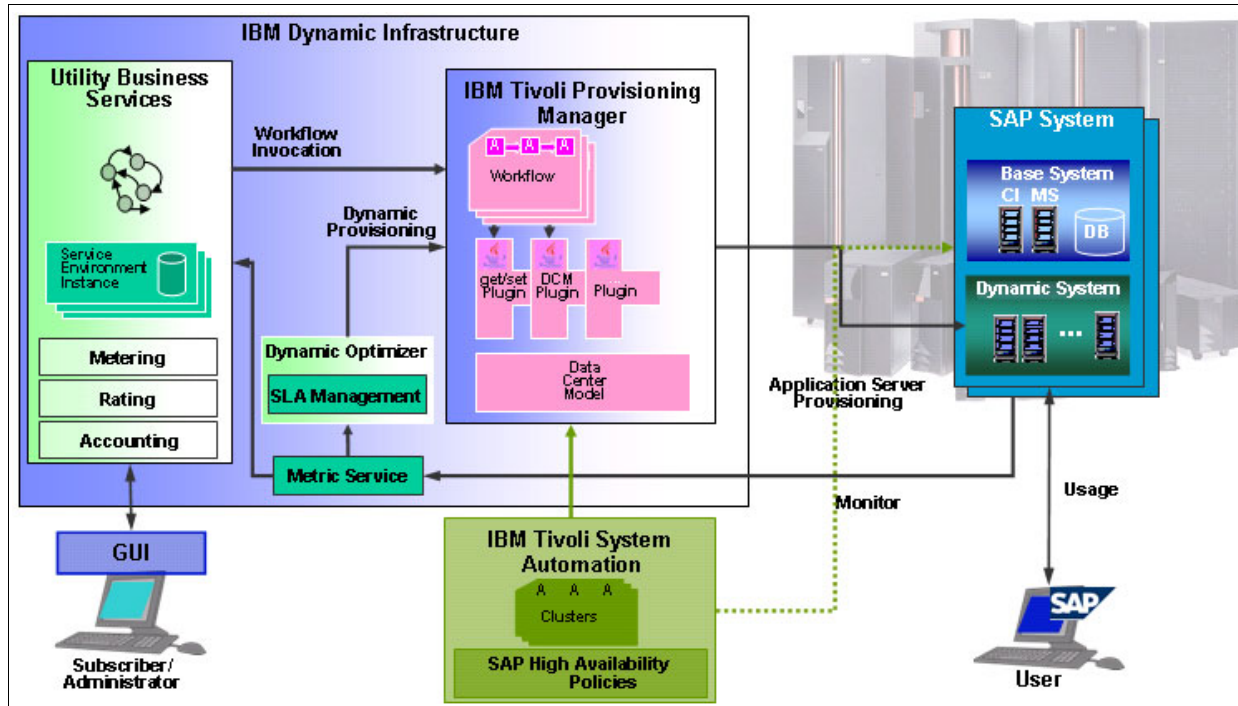


Figure 11-36 The IBM Dynamic Infrastructure Solution Architecture

IBM Dynamic Infrastructure can reduce the high management effort for growing SAP landscapes, speed up the deployment of new SAP systems, and improve the utilization of systems, thus helping to lower the total cost of ownership (TCO). The combination of IBM's virtualization and provisioning technologies with this very cost effective platform provides you with a modern and competitive solution to support your growing SAP landscape

11.7.3 Storage virtualization

IBM Virtualization Engine Suite for Servers may be complemented by the IBM Virtualization Engine Suite for Storage.

The IBM TotalStorage Open Software family combines the power of IBM storage virtualization software and Tivoli storage management software to help you improve the management of SAN-based storage and data. These solutions are designed to help you simplify your storage infrastructure, optimize your storage utilization, and enable your business to adapt quickly and dynamically to variable environments. The capabilities of virtualization and effective storage management help build an operating environment that can increase the flexibility and resiliency of your business in an on demand world.

Figure 11-37 on page 225 shows IBM Storage Management capabilities.

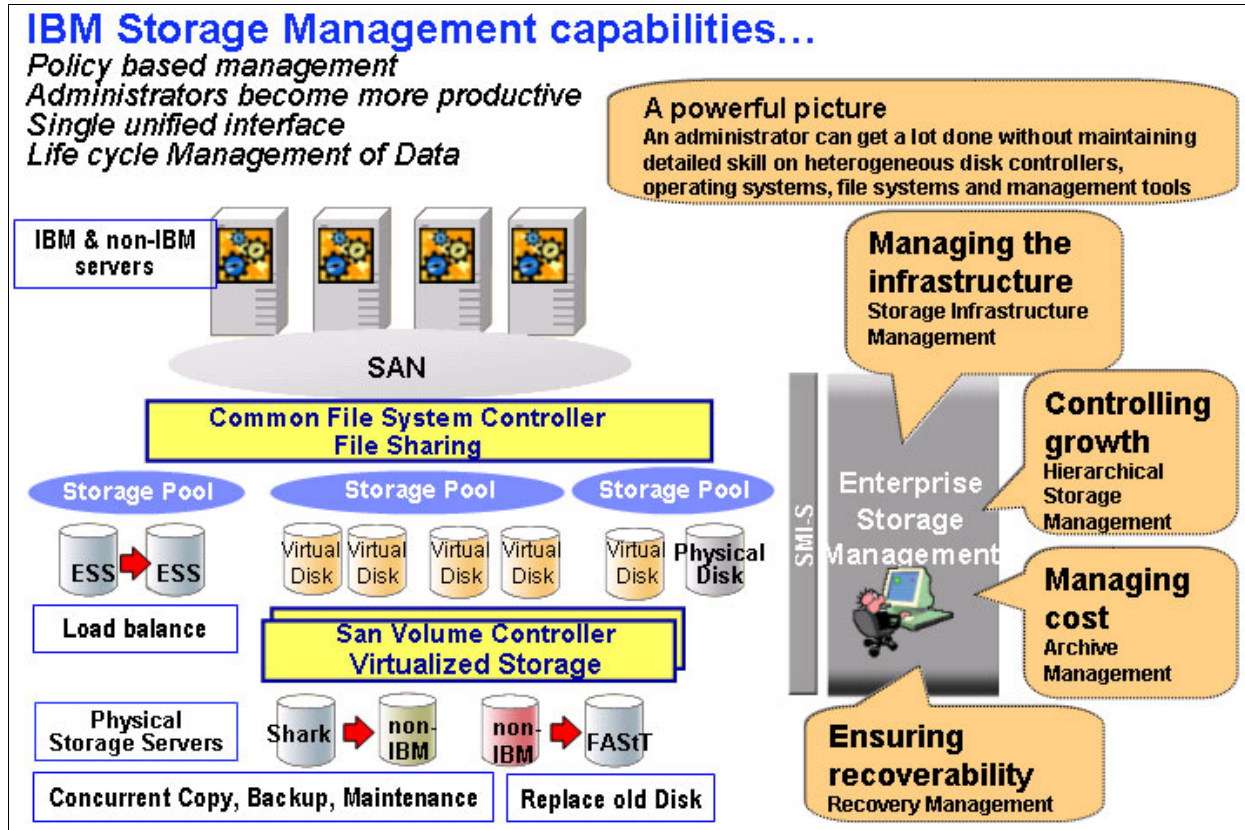


Figure 11-37 IBM Storage Management capabilities

IBM TotalStorage Productivity Center

The IBM TotalStorage Productivity Center is an open storage infrastructure management solution designed to help reduce the effort of managing complex storage infrastructures and to help improve storage capacity utilization and administrative efficiency. It is designed to enable an agile storage infrastructure that can respond to on demand storage needs.

The IBM TotalStorage Productivity Center is comprised of:

- ▶ IBM TotalStorage Productivity Center for Data
- ▶ IBM TotalStorage Productivity Center for Fabric
- ▶ IBM TotalStorage Productivity Center for Disk
- ▶ IBM TotalStorage Productivity Center for Replication

IBM TotalStorage SAN Volume Controller

IBM TotalStorage SAN Volume Controller is designed to increase the flexibility of your storage infrastructure by enabling changes to the physical storage with minimal or no disruption to applications. It combines the capacity from multiple disk storage systems into a single storage pool, which can be managed from a central point. This is simpler to manage and helps increase utilization. To help further simplify operations, SAN Volume Controller also allows you to apply advanced copy services across storage systems from many different vendors.

IBM TotalStorage SAN File System

The IBM TotalStorage SAN File System (based on IBM Storage Tank™ technology) is designed to help reduce the complexity of managing files within SANs. The SAN File System is designed to help lower the cost of storage management and enhance productivity by providing centralized and policy-based storage and data management for supported heterogeneous server, OS, and storage platforms.



On Demand Business solution examples

This chapter provides examples of On Demand Business solutions. The solutions are grouped into two major categories that reflect client's top priorities:

- ▶ Growth through innovation
- ▶ Productivity and IT optimization

Within each category, solutions are grouped into the following subcategories:

- ▶ Growth through innovation
 - Improving the client experience
 - Integrating the supply chain
 - Driving product differentiation
 - Driving organizational change and employee productivity
- ▶ Productivity and IT optimization
 - Increasing business flexibility
 - Leveraging information insights
 - Simplifying/optimizing the IT environment
 - Enhancing business resilience, security, and compliance

12.1 Growth through innovation

The growth through innovation category of On Demand Business solutions is broken down into the following subcategories, which are described in this section:

- ▶ Improving the client experience
- ▶ Integrating the supply chain
- ▶ Driving product differentiation
- ▶ Driving organizational change and employee productivity

12.1.1 Improving the client experience

Today's businesses aspire to have true client-centric business strategies. They want a full view of every interaction with every client across every channel. They want to enable these clients to service themselves through easy-to-use interfaces. They want to be able to personalize services and products for each client without driving up costs. And they want to be able to anticipate and be ready to address these needs before the competition. Ultimately, businesses are turning to IBM and its Business Partners to help them differentiate themselves in the eyes of their most valuable clients.

Top client priorities:

- ▶ Self-service capabilities via Web, phone, on site, or other channels
- ▶ Data capture, analysis, and leverage to proactively identify client needs
- ▶ Ability to develop a holistic view of clients to maximize relationships
- ▶ Seamless client interaction across multiple channels.

Questions to ask:

- ▶ Is client retention a concern for your business?
- ▶ Is the information you need difficult to obtain?
- ▶ Can you make accurate and timely decisions?
- ▶ Do you have a single view of the client across business units?

Banking Multichannel Transformation Solution

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Banking

The Banking Multichannel Transformation Solution is focused on all the client touch-point channels: branches, contact centers, and self-service (ATMs and Web). To become more client-focused, banks are moving away from treating these channels as separate silos. This is an opportunity to work with top executives on creating a new strategy for integrating banking channels and designing a unique client experience for the bank. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/financialservices/doc/jsp/indseg/banking/multichannel/>

Application hosting for Siebel and Siebel CRM OnDemand

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

Clients can leverage a Siebel 7 customer relationship management (CRM) solution to help gain a competitive edge faster, at lower cost, and with less IT complexity, versus using an in-house implementation. This comprehensive managed solution combines IBM Siebel

Systems application expertise with top-rated, security-rich IBM e-business Hosting™ and optional, functional application management designed to deliver a leading, Web-enabled Siebel 7 service. For more information on this solution, please refer to

<http://www-1.ibm.com/services/us/index.wss/offering/ebhs/a1001405>

CRM and Contact Center Transformation

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Telecoms

IBM CRM Transformation and Contact Center BTO Solutions are designed to enable service providers to provide their clients with consistently superior client service across all contact channels while reducing costs, improving client loyalty, and increasing revenue. CRM and Contact Center Transformation includes: Client interaction, which includes sales automation and incentive management, marketing fulfillment and response and client service, Collaboration, which includes contact center infrastructure and self-service, and Business Intelligence and Analytics, which offers data administration and business analytics. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/telecom/doc/jsp/indseg/crm/>

Social services and Social Security Solutions

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Government.

The IBM Business Solution for social services and Social Security provides a framework and solution components that are designed to enable an organization to modernize and transform client service and enhance relationship management capabilities. The modernization can be implemented in discrete steps utilizing the solution components in accordance with the business priorities of that organization. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/government/doc/jsp/indseg/all/g/>

IBM Workforce Mobility Service

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Telecoms.

IBM Workforce Mobility Service can help wireless service providers differentiate their products and gain a competitive advantage by providing value-added services to their corporate clients. Wireless instant messaging enablement, the first capability of the IBM workforce mobility service, is a carrier-grade utility for linking desktop and mobile workers. Wireless providers can now resell the service profitably, with a low cost-of-entry for bringing a new service to market. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/offering/ebhs/a1001825>

CRM Consulting Capabilities

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM CRM Consulting services help clients maximize every interaction with their clients: to make positive impressions, increase loyalty, and improve the bottom line. IBM client relationship management services help clients integrate their sales, marketing, and client service functions, and improve sales performance across all channels. For more information on this solution, please refer to:

http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005261

WebSphere Portal Express

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Telecoms.

WebSphere Portal Express for Multiplatforms V5.0 combines features of the WebSphere Portal family with simplified installation and the option for user or processor-based licensing. This combination is designed to enable small businesses as well as departments within larger companies to more easily deploy sophisticated employee, Business Partner, and client portals. The WebSphere Portal companion product, WebSphere Portal Express Plus for Multiplatforms V5.0, contains all the features of WebSphere Portal Express and adds collaboration features such as instant messaging and virtual team rooms. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/genservers/portalexpress/features/>

Application Hosting

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM Application Hosting provides successful hosting of Web systems for end users. Improve speed to market by relying on IBM expertise in designing, building, and running large-scale IT environments. Application hosting can help reduce up-front costs, mitigate risk for rapidly changing technological and security environments, help companies gain the flexibility to embrace innovation as it emerges, and free up resources to focus on business rather than IT application issues. For more information on this solution, please refer to:

http://www-1.ibm.com/businesscenter/smb/us/en/contenttemplate/gcl_xm1id/13688

IBM Managed Hosting: Infrastructure Solutions with Server Management, Entry

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

The IBM Infrastructure Solutions with Server Management, Entry offering is specifically designed for clients with a small number of servers who do not have the transaction volumes or application complexity to justify a completely dedicated network infrastructure, but need to support a growing number of IBM, Microsoft-, or Sun-based Web applications. For more information on this solution, please refer to:

http://www-1.ibm.com/businesscenter/smb/us/en/contenttemplate/gcl_xm1id/3349

12.1.2 Integrating the supply chain

All over the world, clients need to manage their supply chains and maintain constant connections with their clients. The lines of communication need to be open as wide as possible so companies can anticipate and respond to demands as they happen. To do so means more than just a seamless exchange of data and information. It also means getting in sync with key players through ongoing, active collaboration. The ability to adapt quickly is the single most important component in maintaining strong relationships and growing the business.

Top client priority:

- Seamless, secure information sharing between employees, suppliers, partners, and clients.

Questions to ask:

- ▶ Can you anticipate capacity and supply issues and react quickly?
- ▶ Can you access demand and supply data in real time?
- ▶ Can you see your supply chain across functions and partners?

Network transformation

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Telecoms.

Service providers face complexities as they migrate from their legacy voice or data networks to a converged MPLS/IP-based network infrastructure. Network Transformation helps service providers develop and deliver new products and services on new and converging networks. Capabilities include New Revenue Streams, which provide IP-based applications (for example, IP Centrex), VoIP, content delivery and management systems; Integration Services, which integrate the new networking environments into the legacy OSS/BSS; migration to a new series of NGOSS platforms; Network Simplification; and Collaboration services, which implement new collaborative working platforms, commerce and procurement. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/telecom/doc/jsp/indseg/networks/>

Customs, ports, and border management solutions

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Government.

Customs, ports and border management solutions can enhance collaboration among people, systems, and organizations while improving compliance and strengthening risk management. The heightened focus on security threats and transnational crime affects port organizational strategies and operational priorities, while the private sector expects customs and ports to improve clearance efficiencies to support their integrated, just-in-time supply chain requirements. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/government/doc/jsp/indseg/all/b/>

Banking and insurance core systems

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Insurance.

The IBM Core Systems Transformation solution is designed to enable banks and insurance companies to move from individual infrastructures supporting the interoperation of each application and channel toward a common infrastructure supporting all interoperation for all applications and channels. This enables product-based applications to participate in client-centric processes, makes critical data available in a timely fashion as a primary input required by financial and business systems, and helps ensure that end-user bundled products can be constructed in a competitive way. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/financialservices/doc/jsp/indseg/banking/>
<http://www-1.ibm.com/industries/financialservices/doc/jsp/indseg/insurance/>

Supply Chain Management consulting capabilities

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Supply Chain Management Consulting can help clients optimize supply chains and operations and tie process improvements to operational metrics and financial performance measures like return on assets. For more information on this solution, please refer to:

http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005268

IBM Bio Pharmaceutical Solution

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Pharmaceutical.

IBM Bio Pharmaceutical Solution, a qualified mySAP All-in-One Solution, is specifically designed to help mid-size pharmaceutical and biotech companies meet the requirements of the Food and Drug Administration (FDA) while enabling growing companies to make faster, more informed business decisions. It offers a preconfigured, prepackaged ERP solution, delivered with services such as customization, implementation, management, and hosting. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/summary/imc/a1003025>

IBM Integrated Platform Express

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

The IBM Integrated Platform Express offering enables IBM resellers and Independent Software Vendors (ISVs) to add business applications, like enterprise resource planning and supply chain management solutions, to an integrated hardware and software offering that includes IBM Intel-based servers and IBM Express software. The offering enables partners to quickly create an inexpensive, complete Linux-based solution they can resell to SMB clients, as well as a low-cost platform they can use to test and deploy new Linux applications. Additionally, by using this platform, developers can respond to market demand faster because the initial integration of the IBM hardware and software is completed by an IBM Business Partner, saving time and money compared to ordering the items separately and integrating each piece. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/solutions/linux/integrated/xseries.html>

12.1.3 Driving product differentiation

Clients know that innovation is a must. To stay ahead of the competition, they need to innovate in two ways:

1. With fresher product and service ideas
2. By getting new products to market and to the client faster

Plus, they are aiming to maximize profitability for the product mix they manage and deliver. Their management processes for getting innovations to market are often *ad hoc* or bureaucratic, and new products get bogged down in the system.

Top client priorities:

- ▶ Faster product/service development and marketing
- ▶ Improved existing product-line profitability and new product development
- ▶ Integration of client needs into product development.

Questions to ask:

- ▶ Does your development cycle cost too much and take too long?
- ▶ Is your R & D linked with marketing analysis and requirements?
- ▶ Can you predict what will succeed in the market?

Service Delivery Platform

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Telecoms.

IBM Service Delivery Platforms solutions are designed to enable the innovative development and delivery of the services portfolio in order to help increase revenue and profitability, increase service-portfolio flexibility, decrease time to market for new services, and improve the quality of the client experience. The solution is designed to enable the building of a flexible services delivery platform and its integration into an existing environment with schedule reliability and low implementation risk. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/telecom/>

IBM Product Lifecycle Management (PLM) Solutions

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Manufacturing, Auto, Electronics, Aerospace, and Defense.

IBM Product Lifecycle Management is an extended enterprise solution that facilitates the sharing of product data across all company functions, clients, and suppliers, and thereby helping enable reduced product development cycle times and faster delivery of products to market. Product Lifecycle Management is the strategic approach for managing the creation and dissemination of engineering data throughout the extended enterprise. For more information on this solution, please refer to:

<http://www-1.ibm.com/solutions/plm/>

Product Data Management Service

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Electronics.

IBM Product Data Management Service provides a network-based central repository for managing and archiving product design documents in a security-rich fashion. It helps eliminate barriers to distributed product development, enabling real-time collaboration across extended teams. Plus, it facilitates standardization of OEM design practices throughout the supply chain, helping to increase product quality and market responsiveness while lowering the cost of production. For more information on this solution, please refer to:

<http://www-1.ibm.com/solutions/plm/doc/content/resource/business/1217738113.html>

IBM Application Innovation Services

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

Application Innovation Services assist clients to unify strategy, design, and technology, and deliver solutions that create lasting business value. A global network of Innovation Centers help accelerate client access to multiple disciplines effectively and persistently. Each Innovation Center has specific sector alignment that enhances understanding and response to the unique needs of different industries. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/offering/bcs/a1000302>

IBM PLM Express Solutions

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Manufacturing, Auto, Electronics, Aerospace, and Defense.

The IBM Product Lifecycle Management Express Portfolio™ can help enable clients with a strategic approach to creating and managing product related intellectual capital, from conception to retirement. For more information on this solution, please refer to:

http://www-1.ibm.com/businesscenter/smb/us/en/contenttemplate/gcl_xmlid/14285/nav_id/service/&ca=SMBPLM092003&me=W&met=inli&re=SMBExpress

RFID technologies

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Retail.

Radio frequency identification (RFID) utilizes smart tags to share inventory data across the supply chain and with multiple trading partners, to help make the inventory process more efficient. IBM helps reduce the complexities associated with implementing a comprehensive RFID solution, leading clients through the entire process from start to finish with a flexible, scalable solution framework. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/consumerproducts/doc/content/solution/956491223.html>

12.1.4 Driving organizational change and employee productivity

Clients need to uncover hidden value in their institutions. Achieving change requires an understanding of the issues, challenges, and pain points in their industries. It also requires in-depth knowledge of On Demand Business processes, skills, and technology to enable change, and cultural renovations to make change work. Clients also want more from their staff and employees expect more from them. Six of ten CEOs say limited skills or leadership inhibits their companies ability to change. Clients must improve HR processes and foster a culture that stimulates growth, even in risk-averse environments. They must keep staff strategically aligned, motivated, skills rich, and agile to manage change.

Top client priorities:

- ▶ Leadership development staff empowerment tools and information
- ▶ Management systems that promote a culture of innovation
- ▶ E-learning and just-in-time training
- ▶ Productivity measurement and tracking

Questions to ask:

- ▶ Does your development cycle cost too much and take too long?
- ▶ Do most of your staff have mainly administrative responsibilities and flat productivity?
- ▶ Is management information inhibited by fragmented systems?
- ▶ Do you need to increase employee communication and collaboration?
- ▶ Can employees make fast, well-informed, and client-focused decisions?

Strategy and Change Consulting

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

The IBM Strategy and Change practice helps companies envision future strategies, operationalize those strategies, and transform their enterprises. Business, operations, technology, and organization strategy consultants, together with IBM Research and leading academics, develop and execute technology-driven strategies at many world-leading companies. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/businesstopic/bcs/a1000401>

On Demand Business Workplace

Business Size: Large Enterprise. Solution Type: Infrastructure Solution. Industry: Cross.

IBM On Demand Business Workplace is a comprehensive suite of software, hardware, services and expertise that creates an environment in which users dynamically interact with integrated business processes, other employees, partners, suppliers, and clients. On Demand Business Workplace simplifies access to content, applications, people, and processes. It includes an enterprise-wide portal that allows work from virtually anywhere, at any time, faster and more effectively. The result: a workplace tailored specifically to each person's role. For more information on this solution, please refer to:

http://www-1.ibm.com/services/us/index.wss/offerfamily_services/igs/a1001733

Trade Process Transformation

Business Size: Large Enterprise. Solution Type: Business Solution. Industry: Financial Markets.

Differentiation is a key driver of growth. Product/service innovation will be achieved only through new capabilities and business transformation. IBM Trade Process Transformation solutions provide Financial Information Interchange, Trade, and Order Management, providing an end-to-end, automated order capture and execution environment, and end-to-end Transaction Process Monitoring from the point of inception through to reporting and resolution management. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/financialservices/doc/jsp/indseg/financialmarkets/tradeprocess/>

Human Capital Resource Consulting

Business Size: Large Enterprise. Solution Type: Cross. Industry: Cross.

IBM Human Capital Resource Consulting helps clients improve the cost, quality, and strategic value of enterprise HR services and empower its workforce to be more productive and responsive. Offerings include human capital management services, human resources business transformation outsourcing, and learning and development solutions. For more information on this solution, please refer to:

http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005263

Banking Payment Solution

Business Size: Large Enterprise. Solution Type: Business Solutions. Industry: Banking.

The IBM Banking Payments Solution can help financial services companies cut operating costs and increase fee-based revenue. Banks can break through IT silos to reduce redundant functions, rationalizing and sometimes eliminating back-office processes along the way. In

addition, manual processes begin to approach extinction, reducing error rates and the opportunity for fraud. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/financialservices/doc/jsp/indseg/banking/payments/>

Total Solution Financing

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Project Financing™ is a single-source financing solution for large-scale, multi-vendor business transformations that can include consulting services, infrastructure investment, and business process implementation. Highly customizable structures can be tailored to even the most complex project plans, and can cover the entire project's life cycle. IBM Project Financing facilitates project approval, preserves cash flow and credit lines, and allows clients to better match costs to projected benefits to enable self-funding. For more information on this solution, please refer to:

<http://www-1.ibm.com/financing/us/ondemand/offerings/psf.html>

IBM Integrated Platform Express for Employee Workplace

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

The IBM Integrated Platform Express for Employee Workplace is an efficient and cost effective portal solution designed to make it easier for employees to access, customize and manage, in one place, all the business-critical knowledge and content-management tools they need to operate efficiently in a busy environment. The offering has been designed to offer faster return on investment (ROI) because its feature set is nearly the same as more-expensive alternatives. For more information on this solution, please refer to:

<http://www-1.ibm.com/businesscenter/smb/us/en/xslpage/xmlid/25193>

12.2 Productivity and IT Optimization

The Productivity and IT Optimization category of On Demand Business solutions is broken down into the following subcategories, which are described in this section.

- ▶ Increasing business flexibility
- ▶ Leveraging information insights
- ▶ Simplifying/optimizing the IT environment
- ▶ Enhancing business resilience, security, and compliance

12.2.1 Increasing business flexibility

Clients need to be more responsive to changing client and market conditions. Annual budgeting that locks down resources and the ability to dynamically allocate resources in response to opportunities poses a huge barrier to business flexibility. Many clients want to be able to sense and dynamically react to competitor moves as well as changes in demand.

Top client priorities:

- ▶ Process, application, and system integration
- ▶ Standardized and automated business processes
- ▶ Flexible cost structures

- ▶ Adjustable business processes to meet specific or changing needs
- ▶ Consolidated, streamlined business applications aligned with business needs.

Questions to ask:

- ▶ Do your processes and systems inhibit change?
- ▶ Are you always in reaction mode?
- ▶ Do budget constraints prevent business flexibility investments?
- ▶ Can your cost structures cope with constant change?

IBM Strategy and Planning for SOA

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Strategy and Planning Services for Web Services can help determine where and how a service-oriented architecture (SOA) built with Web services can add value to a client's business. A service-oriented architecture can improve flexibility. Clients can create and deploy services that help their business respond to ever-changing needs, virtually regardless of the platforms on which they run or the programming languages in which those platforms were built. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/itservice/its/a1002583>

SOA Solutions

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Service-oriented Architecture (SOA) Solutions can help address the business challenges and IT imperatives created by a constantly changing marketplace. Organizations need to use the assets they have, and manage costs and resources effectively. As clients begin to implement a service-oriented architecture, they begin to reap benefits from both the IT and the business perspective. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/info/openenvironment/soa/>

Financial Management Consulting

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Financial Management Consulting can help clients manage risk while contributing to enterprise-wide profit improvement and increasing shareholder value. IBM can help CFOs and finance organizations design and implement financial processes and underlying technologies to overcome their business challenges. For more information on this solution, please refer to:

http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005262

Rational Application Developer for WebSphere Software

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

Rational Application Developer for WebSphere Software enables developers to quickly design, develop, analyze, test, profile, and deploy Web, Web services, Java, J2EE and portal applications. Optimized for IBM WebSphere software, and supporting multi-vendor runtime environments, the offering is powered by the Eclipse open source platform so developers can

adapt and extend their development environment to match their needs and increase productivity. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/awdtools/developer/application/index.html>

WebSphere Business Integration Server Express

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

WebSphere Business Integration Server Express is a comprehensive package with extensive capabilities that can help mid-size businesses improve business efficiencies, speed time to market, lower the total cost of ownership, and transform their operations to function like an On Demand Business. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/integration/wbiserverexpress/library/faq.html>

IBM WebSphere Business Integration products

Business Size: Large Enterprise, Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM WebSphere Business Integration products offer an integrated portfolio of products to deliver all six integration capabilities and the core service-oriented infrastructure: model, transform, integrate, interact, manage, and accelerate. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=products/businessint>

12.2.2 Leveraging information insights

Clients need to develop a single view of every client in spite of disparate systems and disconnected databases. Integrating information is the core requirement to create value from existing data. Analytics comes next. Clients must be able to sense new trends and respond with the right products and services. They need to make decisions about the market faster and more accurately.

Top client priorities:

- ▶ Standardize business applications to develop a unified view of key information.
- ▶ Simplify collaboration between employees, suppliers, partners, and clients.
- ▶ Capture and analyze information to improve the speed and accuracy of business decisions.
- ▶ Access and utilize all types of information, in structured and unstructured forms.
- ▶ Improve market forecasting.

Questions to ask:

- ▶ Do you have islands of client information and applications spread across your organization?
- ▶ Can you identify your most loyal, profitable clients to provide them with personalized offerings?
- ▶ Do your employees have a single, integrated point of access to the information, applications, people, and processes they need to perform their jobs?
- ▶ Can field and mobile personnel access critical information, applications and processes across a variety of networks with a selection of devices?

- Can you capture and use both structured and unstructured data (voice, text, images, fax, e-mail, and so on) to better understand client needs?

IBM DB2 Content Management

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

DB2 Content Manager can help organizations solve critical problems by managing and integrating all forms of information, including scanned images, audio, video, and information from multiple sources. For more information on this solution, please refer to:

http://www-306.ibm.com/software/data/cm/solutions_ceo.html

AMS Portfolio Management Services

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Application Management Services helps clients manage their application portfolio to achieve maximum business value. Client organizational applications are approached as strategic business tools that can be used to fundamentally improve how a business operates and communicates. IBM capabilities extend to helping organizations confront change, reduce operational costs, and achieve a measurable ROI from their application portfolio, supported by proven methodologies, tools, and skills. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/itservice/ams/a1000410>

IBM Total Storage SAN solutions

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

An important part of the IT infrastructure, IBM TotalStorage SAN solutions provide integrated SMB and enterprise solutions with multi-protocol local, campus, metropolitan, and global-storage networking. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/storage/san/index.html>

IBM Grid for Analytic Acceleration: Customer Insights

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Banking, Insurance, Financial Markets, and Life Sciences.

IBM Grid for Analytic Acceleration: Customer Insight provides an efficient, scalable and standards-based solution aimed at providing a major competitive advantage for organizations wanting to leverage insights from their data. The Grid leverages computation and information resources across an organization, accelerating time to results and increases the number of modeling iterations achievable within a given time frame. For more information on this solution, please refer to:

http://www-1.ibm.com/grid/solutions/by_business/bus_analytics.shtml

Integrated Information Dashboard Engine Appliance (IIDEA)

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Auto Manufacturing, Electronics, Aerospace, and Defense.

IIDEA is an integrated offering designed to help companies develop a supply-chain management environment that provides a uniform view of information to better plan, forecast, manage inventory, and schedule. Combining the strengths of IBM DB2 and xSeries

technology with Informatica's PowerAnalyzer and PowerCenter products, IIDEA is a complete rapid deployment platform for data integration and business reporting in small to mid-size businesses. For more information on this solution, please refer to:

<http://www.developer.ibm.com/solutions/isv/igssg.nsf/AllSolutionsbyID/86256B7B0003EBBF86256F4D007E87B0?OpenDocument>

IBM DB2 Content Manager Express Edition

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM DB2 Content Manager Express Edition is a comprehensive content management solution that is designed to increase information availability and security. It streamlines document routing and document management. The workflow capabilities lets clients share digitized content among diverse applications and across processes in a cost-effective and security-rich manner. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/data/cm/cmgr/mp/edition-express.html>

CIAM Building Blocks

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Life Sciences.

CIAM Building Blocks are designed to provide complete end-to-end electronic records life cycle management to address regulatory compliance, content management, and IT infrastructure simplification. It addresses data storage and disaster recovery for early discovery, development, manufacturing, and post-market surveillance. For more information on this solution, please refer to:

<http://www-1.ibm.com/industries/healthcare/doc/content/resource/technical/1170458105.html>

12.2.3 Simplifying/optimizing the IT environment

Clients want simplified IT infrastructures aligned with their business goals. Past IT investments may have been driven by the need to keep up. But now they are focused on making existing infrastructures work harder, in a more integrated way. Clients hope to modify their IT infrastructures to be more flexible and automatic. Clients want to invest in technologies that take the complexity out of systems management and allow IT managers to focus on business improvement.

Top client priorities:

- ▶ Flexible IT capacity
- ▶ Customizable, reconfigurable systems and applications
- ▶ Quick deployment of standardized, interoperable systems and applications
- ▶ New systems and applications that integrate into existing infrastructure
- ▶ Cost reduction and containment in line with growth
- ▶ Improved asset utilization

Questions to ask:

- ▶ Do you plan a major application or infrastructure rollout?
- ▶ How will you integrate performance and stress testing?

- ▶ Are you considering new virtualization technologies to cut IT costs and boost performance?
- ▶ Do you prefer to test automation and virtual solutions before initiating production?
- ▶ Is your infrastructure overbuilt to handle peak capacity, often leaving long periods of downtime and underuse?
- ▶ Would you be open to alternatives like out-tasking, outsourcing, and application or infrastructure hosting to better balance workload with demand?

IBM Tivoli Intelligent Orchestrator

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Tivoli Intelligent Orchestrator can improve resiliency and responsiveness by providing server capacity to meet peak business demands, where its needed, utilizing existing hardware, software, and network devices without rewiring or changing network architecture. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/tivoli/products/intell-orch/>

IBM Tivoli Provisioning Manager

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Tivoli Provisioning Manager is designed to automate the manual tasks of provisioning and configuring servers, operating systems, middleware, applications, and storage and network devices, using pre-built, industry best practice workflows to provide control and configuration of major vendors' products. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/tivoli/products/prov-mgr/>

IBM Total Storage SAN Volume Controller

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM TotalStorage SAN Volume Controller is designed to increase storage infrastructure flexibility by enabling changes to the physical storage with limited or no disruption to applications. Providing expanded support for storage systems manufactured by EMC, HP, and HDS, SAN Volume Controller can enable clients to match the cost of the storage to the value of their data and combines the capacity from multiple disk storage systems into a single storage pool, which can be managed from a central point. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/storage/software/virtualization/svc/index.html>

IBM Virtualization Engine

Business Size: Large Enterprise. Solution Type: Solution Building Block. Industry: Cross.

IBM Virtualization Engine can help organizations improve the effectiveness of information technology, as it enables individual distributed resources across the enterprise to function cohesively as a single pool or entity. This allows more efficient access and management of resources across an organization by effect and need rather than physical location. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/eserver/about/virtualization/index.html?ca=vedemot&met=web&me=escalout>

Infrastructure Services Readiness Engagement

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

Infrastructure Services Readiness Engagement is a customized workshop that introduces new and emerging On Demand Business practices, technologies, and strategies. The workshop applies future goals and strategies to the development of plans and actions to enable current client IT environments to support an On Demand Business through the exploration of virtualization technologies. Workshops are offered to explore autonomic computing, utility computing, virtualization technologies, and grid computing. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/offering/its/a1004757>

Open Infrastructure Offering

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

The IBM Open Infrastructure Offering provides innovative ways to manage assets, improve cash flow, reduce capital spending, and enhance return on investment. The offering addresses fundamental issues associated with building and managing an infrastructure: total cost of ownership, improved business utilization, and enterprise-wide integration. Since no two infrastructures are identical, each client will receive a customized solution. For more information on this solution, please refer to:

<http://www-1.ibm.com/financing/us/ondemand/offerings/oio.html>

Deep Computing Capacity on Demand Business Centers

Business Size: Large Enterprise and Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM Deep Computing Capacity on Demand enables clients to access supercomputing power securely and reliably via Virtual Private Network over the Internet to respond to peak workloads and capture business opportunities that would otherwise be out of reach. Clients can better tackle ultra-scale High Performance Computing challenges and better manage HPC asset utilization and total cost of computing. IBM can help clients improve their business agility while avoiding the financial and technical risks and responsibilities of owning and operating a supercomputer. Clients who purchase or lease sufficient HPC hardware, software, and services to meet average workload demands can reserve additional HPC capacity in an IBM DCCoD center as needed to satisfy peak workload demands on a variable cost, pay-as-you-go basis. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/deepcomputing/cod.html>

IBM Lotus Web Conferencing

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

Lotus Web Conferencing V6.5.1 enables people to work together online, instantly and securely, from wherever they may be located, using an intuitive meeting-room metaphor. Based on the market-leading product, Lotus Web Conferencing allows participants to securely view shared presentations, documents, and applications over the Web, as well as document spontaneous ideas and interactions using the online whiteboard. For more information on this solution, please refer to:

<http://www.lotus.com/products/product3.nsf/wdocs/homepage>

12.2.4 Enhancing business resilience, security, and compliance

Clients need risk management for their increasingly volatile business environment. They also need to understand and be prepared for potential security threats that could compromise client information or business operations. They are focused on continuity for clients who expect always on, always available service and delivery. They need help identifying what to protect and from whom, as well as associated risks in order to implement and manage effective policy. Regulatory compliance is also a growing concern. Clients must have controls in place for clear and accurate reporting. They see compliance as an opportunity to evaluate internal financial management controls, business risk, and processes to improve overall business management.

Top client priorities:

- ▶ Service-level continuity
- ▶ IT infrastructure protection
- ▶ Threat assessment and business protection
- ▶ Applications and functionality to address risk, compliance, and process improvement
- ▶ Risk management

Questions to ask:

- ▶ Can you prove compliance quickly to auditors?
- ▶ Are the bulk of your help-desk calls password related?
- ▶ Do users need to log in many times to your IT resources?
- ▶ Can you keep up with new security threats and vulnerabilities?
- ▶ Can you deploy intrusion detection with your current staff?

IBM Security and Privacy Services

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

IBM Security and Privacy Services professionals have years of experience helping clients understand and address information technology, business security, and privacy requirements, and can help clients assess, plan, design, implement, and run a more secure, trusted IT environment with sound privacy practices in which they can have confidence. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/itservice/bcs/a1000405>

IBM TotalStorage DR550

Business Size: Large Enterprise and Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

TotalStorage DR550 is designed to help businesses manage and safeguard retention-managed data and other critical information assets efficiently. It helps organizations adhere to new regulatory and legal compliance requirements. For more information on this solution, please refer to:

<http://www-1.ibm.com/servers/storage/disk/dr/index.html>

IBM Workplace for Business Controls and Reporting

Business Size: Large Enterprise and Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM Workplace for Business Controls and Reporting is an integrated solution designed to help manage and assess business controls. It provides the ability to document, monitor, and test internal controls to help manage financial reporting processes cost-effectively and sustainably. IBM Workplace for Business Controls and Reporting allows companies to move from compliance to control management and then to enterprise risk management. For more information on this solution, please refer to:

<http://www.lotus.com/products/product5.nsf/wdocs/bcghomepage>

IBM Tivoli Security Compliance Manager

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

This security policy compliance product acts as an early warning system to identify vulnerabilities and policy violations. Tivoli Security Compliance Manager helps define consistent security policies and monitor compliance. Security policies can be based on both internal requirements and industry-standard policies. For more information on this solution, please refer to:

<http://www-306.ibm.com/software/tivoli/products/security-compliance-mgr/>

IBM Integrated Security Solution for Cisco Networks

Business Size: Large Enterprise. Solution Type: Infrastructure Solution. Industry: Cross.

In a networked world, many-to-many connectivity can drive immense benefits, but can yield corresponding risks. The IBM Integrated Security Solution for Cisco Networks, an integrated offering, offers a security-rich, policy-based security compliance and remediation solution and includes services from ITS. For more information on this solution, please refer to:

<http://www-03.ibm.com/security/cisco/offerings.shtml>

Integrated Identity and Access Management

Business Size: Large Enterprise. Solution Type: Individual Product or Service. Industry: Cross.

This service provides a comprehensive framework in which to create policies and practices for integrating security-rich identity and authentication into an On Demand Business environment. User authentication can help reduce the risk of unauthorized access to facilities and systems, while reducing administration and complexity. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/index.wss/offering/its/a1004897>

IBM Managed Security Services

Business Size: Medium Business. Solution Type: Individual Product or Service. Industry: Cross.

IBM Managed Security Services help clients identify and solve real-time security risks by helping to plan, design, construct, and operate a security-rich environment for online applications and transactions for a total security plan. These services offer the ongoing security management, hardware, software, and applications needed to shield a hosting environment and sizeable network from attack 24x7, providing the highest levels of protection

and proactive response in the event a suspicious threat or actual intrusion is detected. For more information on this solution, please refer to:

<http://www-1.ibm.com/services/us/ebhs/html/managed-security-services.htm>



Part 4

Solution design considerations and resources

This part contains helpful considerations for designing On Demand Business Solutions as well as a compilation of resources related to On Demand Business.

It has the following two chapters:

- ▶ Chapter 13, “On Demand Business solution design considerations” on page 249
- ▶ Chapter 14, “Resources and tools for On Demand Business solution design” on page 261



On Demand Business solution design considerations

When creating a new On Demand Business design, the On Demand Business Solution Designer needs to take time to:

- ▶ Understand the client's business, the existing policies, and strategic goals
- ▶ Validate the skills available and needed to implement an On Demand Business solution
- ▶ Consider design criteria that addresses the need for:
 - Flexibility
 - Scalability
 - Reliability
 - Manageability
 - Security
- ▶ Other considerations should include:
 - Life cycle management
 - Systems management
 - User centered design
 - Support
 - Application and information integration
 - Data management
 - Availability and performance
 - Legal

This chapter outlines the importance of these items in designing an On Demand Business solution.

13.1 Understand the client's business

Organizations undertake projects or initiatives to acquire new business capabilities or enhance existing capabilities. An On Demand Business takes more of a capability centric view of the business rather than application functional centric view of the business. A business capability needs to be always viewed within the context of a business process. The process involves a sequence of steps or events that need to occur in achieving the desired business result and ultimately realizes the capability. A business capability is realized by

1. A collection of applications that provide functions to automate specific steps in the business process
2. A set of users interacting with those applications executing the tasks from an operational perspective

Defining a solution to transform a business to an On Demand Business could be approached in one of two ways:

1. By redesigning the business processes and ensuring IT applications are aligned to support those processes
2. By re-engineering the IT landscape and ensuring the impacts to the business processes due to the IT changes are addressed by modifying the existing processes.

Regardless of which end of the spectrum the solution design is approached from, the end result should be reaching a common point where key business processes and the IT applications are integrated effectively so that the business capability is realized and it exhibits On Demand Business characteristics. Specifically, the solution is expected to help innovate the business so that it can differentiate and capture the new value and improve the productivity of resources deployed.

In order to achieve these results, a thorough understanding of client's business and the existing IT capabilities is essential. One of the possible design approaches is to use techniques to build a business process model, which in turn can be used as a base for designing a technology solution. The designer, for example, might use the Component Business Model (CBM) method in order to identify business components, which could then be used in the solution design to build the corresponding business services (the building blocks of every On Demand Business Solution). Prior to building a technical solution (creating the components, customizing and assembling them, and so on), this approach requires deconstructing the current business model, assessing priority components, and modelling existing and new processes and businesses.

By following these steps, the designer will set up a solid base for the solution that will advance the transformation of client's business to being an On Demand Business.

13.2 Validate skills needed

To undertake an On Demand Business transformation journey, a business must consider the following critical resources with key skills working on the implementation of an On Demand Business solution. In addition to the design considerations that are explained in the subsequent sections in this chapter, additional considerations include life cycle management of an On Demand Business solution and user centered design.

Regardless of whether the On Demand Business Solution Designer is just one person performing different roles in the design process, or a team of people is involved in delivering a solution, a fundamental set of skills are needed for the overall success of the project. Some solutions will require all or most of these skills, some only a subset.

Process designers view the business from business process perspective and should have a clear understanding of how humans or end user(s) interact with the IT systems in executing the business process. Process designers must understand the business language and have industry and domain skills and should have Component Business Modeling skills.

Systems architects should clearly understand how the IT components in the E2E (end-to-end) architecture interact or collaborate with one another to automate the business process. From the Solution Designer's perspective, a component in the enterprise's architecture landscape could be a single application or a collection of applications providing congruent business functions.

Application designers or developers develop the key functions provided by individual components in support of the overall business process. The application designers should be highly aware of the application's role in the overall business process and which step of the business process the function automates and how the application fits into the overall scheme of a business process. They will also investigate explicit, declarative service orchestration (aggregation and composition) possibilities.

Service developers are J2EE developers familiar with Web services concepts and XML. They develop service interface and implementation (provider side) and service invocation code (requestor side).

Interoperability Testers verify that the developed requestor and provider implementations interoperate seamlessly and ensures Web Services Interoperability (WS-I) conformance.

Security Specialists are responsible for the definition of security guidelines (policies) and the implementation of security means adhering to these guidelines.

Operations/Deployment Architects provide solutions that manage the systems and infrastructure used by the clients. They should understand how the hosting environment operates today and defines solutions to transform the hosting environment to comply with the characteristics of an On Demand Operating Environment. Operations architects should define systems management processes and methods and work with a team of IT specialists and systems administrators to deploy and run the applications in an On Demand Operating Environment.

13.3 Design criteria

The release cycle for an On Demand Business application consists of the standard phases of planning, requirements, design, development, testing, and deployment. During the design of an On Demand Business solution, there are many criteria to consider beyond just functional requirements. This is because functional aspects specify what behavior to execute, but they do not describe the quality characteristics of the system and do not denote how such behavior should be executed. For example, a requirement could specify implementing a balance retrieval function, while the non-functional criteria would specify that such retrieval should execute below two seconds. This section lists criteria that support such non functional or quality characteristics aspects, defining areas of thought that designers should keep in mind when working on the non behavioral aspects of a solution.

13.3.1 Flexibility

The key to flexibility is integration. Integration can generate new strategic advantages that can lead the way to the implementation of powerful business processes, such as ERP within the organization, and CRM, B2B, and SCM among an organization and its clients, suppliers, and partners. As business needs change, a well-integrated infrastructure can give an enterprise

new flexibility in quickly and economically adapting to changing business requirements. It is critical for clients to have the ability to integrate with a variety of existing systems as business models evolve. As complex as it may seem, the task of integration can be simplified by using a combination of open, standards-based infrastructure standards, comprehensive middleware designed to integrate diverse systems and solutions, and specialized, experienced resources.

Flexibility in integrating client's IT systems was one of the main driving forces behind the SOA, as discussed in 6.2.1, "Service-oriented architecture (SOA)" on page 71. A component-based design based on loosely coupled reusable services is key to building a solution, which will allow clients to quickly adapt to ever changing business conditions.

For further information about the ODOE integration capabilities, which are key to flexibility, see Chapter 6, "On Demand Operating Environment: integration capabilities" on page 67.

13.3.2 Scalability

The value of planning for scalability comes when the business is facing a planned or unexpected change. As traffic volume increases, along with application complexity, scalability becomes a key success factor. Scalability can disrupt performance, availability, response time, and other productivity factors that affect client satisfaction and ultimately the success of the business itself.

To prevent growth from leading to degraded performance and higher costs, enterprises need to build scalability into their IT infrastructures and processes from the start. A comprehensive, end-to-end approach to planning helps reduce the risks and costs of a single component or a new demand from constraining system-wide performance. Flexibility and scalability need to be key attributes of the system, including servers, storage networking, middleware, and data management.

Chapter 5, "Business driven development" on page 59 describes how a solution built for ODOE deployment will ensure the scalability, flexibility in operation/manageability, and reliability of operation, due to enabling computing functions, orchestration, and provisioning.

Virtualization should be a very hot topic on a well designed On Demand Business solution. It has the ability of aggregating pools of resources, helping resource management, and giving a single view of a complex environment.

The core for virtualization should be:

- ▶ Consolidate several servers inside a single point to reduce complexity and cost
- ▶ Help on infrastructure monitoring
- ▶ Help to maximize the use of existing infrastructure

An ODOE application makes use of a variety of services, some being obtained from applications, others from the runtime itself. All of these translate into application dependencies that need to be understood and managed in order to ensure a smooth deployment effort. It is recommended that Solution Designers model their application, especially using a component diagram specifying the various relationships prior to deployment. This will help in the identification of efficient ways of packaging and the reusable components.

The deployment process itself needs to be well understood as early in the life cycle as possible. This will help to identify topology requirements, authorizations that may need to be fulfilled, or any other environmental requirements defined by the target deployment environment, as numerous features built into it assist in the dynamic allocation of processing, memory, storage, and network capacities.

13.3.3 Reliability and manageability

Reliability is essential to ensure secure, uninterrupted operation of an On Demand Business solution. The challenges of successfully conducting online business include being able to support high user volumes, provide fast response times, and ensure the overall reliability of the service.

A design for deploying the solution into an On Demand Operating Environment will help ensure both the reliability and the manageability. ODOE capabilities of autonomic computing are the keys for ensuring the reliability of the operation and the continuity of service to the business. The monitoring, provisioning, and orchestration capabilities in the ODOE will help ensure the full manageability of the environment and ensure operation efficiency and effectiveness.

A design should be fault-tolerant and protect the solution from a single point of hardware failure, as it may be required to guarantee the continuity of the services to business.

13.3.4 Design for security

When designing a security solution, the following should be included in the plan:

- ▶ Assessment of current security risks
- ▶ Protection against accidents, attacks, or natural disasters, and positioning of security as a business enabler
- ▶ Detection of potential threats
- ▶ Recovery from incidents should they occur
- ▶ Management of all or parts of the security process

Identity and access management

Specifically, the design should address the following:

- ▶ Protection of storage and transport of critical information
- ▶ Protection of privacy
- ▶ Reliable environment
- ▶ Data encryption when communicating through public networks or when the data is critical and confidential
- ▶ Authorization and access management policies.
- ▶ Identity management and provisioning

13.4 Other considerations

There are several other considerations to keep in mind when planning and designing an On Demand Business solution.

The management of applications after they are deployed in an On Demand Operating Environment is very critical to ensure that the operational posture of the applications in post-production continue to comply with the On Demand Business characteristics. Any or all business events that trigger increase in the user traffic or data volume need to be projected on an ongoing basis to ensure the On Demand Operating Environment can adapt to handle the increased network and server capacity requirements.

13.4.1 Systems management

Systems management processes deal with the overall management of the On Demand Operating Environment to ensure that the ODOE is resilient from an enterprise's perspective. Transforming the systems management processes to handle the following (among others) must be given a key consideration

- ▶ Automate the frequency of software changes that must be distributed.
- ▶ Tools that are used for software distribution.
- ▶ What should be the frequency of software and hardware upgrades?
- ▶ How many releases of the same software will be allowed to coexist in production?
- ▶ What is the user data backup frequency and expected restore time?
- ▶ Creation and automatic management of user accounts.
- ▶ Management of system license.
- ▶ Automated tools for system administration.
- ▶ Automated service administration tools.
- ▶ Management system to introduce changes including system uninstall.
- ▶ Ongoing monitoring of system health and performance.
- ▶ Automatic notification of errors to service personnel.

An On Demand Business solution should include details about how the application plans to manage resources across a heterogeneous extended environment. The manageability plan must include the ability to modify the system, delete unwanted capabilities, adapt to new operating environments, and restructure the system, if necessary.

This characteristic is complex because manageability aspects exist throughout the full application life cycle at different contextual levels. For example, there are manageability elements in the hardware platforms, for example, heat dissipation and CPU utilization, and there are manageability elements in the application itself, for example, the number of client requests and number of spawn threads. An end-to-end view that correlates all of these events is necessary given that solutions are often distributed across various platforms and systems, making runtime errors difficult to trace.

Understanding what needs to be managed, how it will be monitored, and how that information will be turned into knowledge that can be fed back into the solution for dynamic action is crucial for the design of resilient systems.

13.4.2 User centered design

User centered design is key both from the application functional perspective and how that information is made available to the end user. One of the key characteristics of an On Demand Operating Environment is that the application function exposes the needed information anywhere and anytime when the user needs the information and tries to access it via any type of client application or devices. At the functional level, the solution should offer support for natural language, single and double byte character sets, and be accessible for people with disabilities. From the usage point of view, the solution should always be available and secure.

User access

User access should be considered a design consideration due to the following challenges:

- ▶ Support for end-user devices (interface, voice, and so on)
- ▶ Support for network protocols (You should consider all user access to ensure that all devices will work with your design.)

User interaction

User interaction is critical to a successful On Demand Business solution. You should consider the following keys:

- ▶ Support for a collaborative environment
- ▶ Supports personalization and customizing the environment according to the user profile.

Single sign-on

Single sign-on software allows users in a diverse computing environment to sign on just once but access the network from anywhere. Secure single sign-on removes the need for separate logons or credentials for each application or database that users are authorized to use.

When implementing an On Demand Business solution that might include different Web servers, such as Domino and WebSphere Application Server, you might want to implement a single sign-on solution for authorized users. This saves users the hassle of being prompted to log in as they switch back and forth between servers. Single sign-on can be accomplished by issuing a session token to the browser that is valid for both Domino and WebSphere Application Server.

13.4.3 Support

When considering support during the design process, be sure to include plan for end-user support, client service, and feedback mechanisms.

End-user support

End-user support means that you ensure that the right information is available to the user at the right time and that the user requests go to the right service providers (from the end users' perspective).

Client service

Plans for client service cannot be overlooked as part of the overall On Demand Business solution design, and they should be considered at the beginning. There are numerous options for handling client interactions, including phone calls, frequently asked questions (FAQs) on a Web site, or e-mail responses. Phone calls are the most expensive type of client interaction there is, but there is a need to provide that option. Some clients need to hear a human voice. The first line of communication, and the easiest to implement, could be a FAQ Web site that could answer most of your client service questions. If clients can find the answer to their questions on their own, that has saved you the expense a more expensive form of interaction. E-mail should also be used in addition to an online FAQ. Some clients prefer e-mail, but only if their questions are responded to promptly. Other methods of communication used with clients may include fax-back systems, online chat, or automated callback.

Feedback mechanisms

Feedback mechanisms are used to track the wants, needs, preferences, and dislikes of clients, client segments, or suppliers. You should consider what the company needs to identify, at each touchpoint, where interaction occurs in the business processes and know

what data to collect. Feedback mechanisms that are carefully inserted in key client-facing or supplier-facing processes can make a company appear to understand the needs and desires of its clients or suppliers almost before they do. Clients or suppliers can become annoyed if too much or inappropriate feedback is requested. Datamarts can be used to collect and track the information. Many companies are now using trend analysis, data mining, and query techniques. When they identify new client or supplier trends, they use this information to develop and implement an action plan that quickly capitalizes on this information, while still supporting the firm's On Demand Business strategy.

13.4.4 Application and information integration

On Demand Business solution design should ensure data consistency and integrity. Integration of applications and information in a possible heterogeneous environment is a very complex undertaking and great care needs to be taken to ensure the benefits of the effort:

- ▶ Avoidance of same data in several sources
- ▶ A design that could make a merge of new applications easier
- ▶ Increase in reliability and the quality of data
- ▶ Decrease in complexity of interaction between process and services that are handled by distinct applications

13.4.5 Data management

An On Demand Business Solution design should consider using a variety of data management tools, which can help to bring down the cost of administration with features like query optimization and automated database performance tuning and recovery time.

IBM Data Management tools cover a wide range of database functions, including administration, performance management, recovery and replication, and application management. The solution should consider using data management tools that:

- ▶ Help minimize database outages with extensive diagnostic and self-managing capabilities.
- ▶ Keep system operating at peak performance by consolidating, reporting, analyzing, and recommending changes to database performance functions.
- ▶ Scale reliably to meet the needs of even the largest projects.
- ▶ Speed application deployments.

Structure

A long-term view of the structure of a database (both the implementation and any future changes) is key to the overall cost. Things designed well now will save the client money and time in the future when there is a need to expand and further exploit the database.

Data backup and restore

Backups are copies of active online data stored on offline storage. If an online storage device fails (for example, if a data error occurs or someone accidentally deletes a file), the offline copy of that data can be copied (restored) to online storage. The design should take advantage of the power of autonomic computing and IBM Tivoli tools to help with this task.

Protection planning

Protection planning must be included as part of the On Demand Business solution design. The design must provide a solution that helps manage the ever-increasing amount of data, while allowing simpler data backup and restoration.

For companies seeking to simplify their storage network into one comprehensive data protection program, IBM's storage experts established ten recommendations to respond to the ever-expanding set of data storage demands.

IBM's top ten data protection recommendations include:

1. Use a single program for multiple data protection functions. Implement one intelligent data protection software program with functions such as data backup, mobile backup support, managed data archive, disaster recovery planning, and "hot" online data backup for around-the-clock applications.
2. Use a single program for multiple platforms and networks. Use a single centralized data protection program across the entire enterprise, including as many different computing platforms as possible.
3. Use the most efficient backup methodology possible. Use the appropriate backup methodology (progressive, incremental, differential, image, or full) to reduce the total time required to perform data backups and enable the fastest possible data restores.
4. Use the most efficient offline storage methodology possible. Store the files belonging to specific client computers on the minimum number of sequential tapes to speed data restores and reduce offline storage requirements.
5. Implement datatape space reclamation. Reclaim the empty space left from expired data files by consolidating data from multiple, partially empty tape cartridges to new tapes.
6. Ensure flexible management capabilities. Implement granular policy-based management to allow data protection policies to be set according to organizational needs matching any type of administration hierarchy.
7. Manage it all via the World Wide Web. Use a Web-based interface to manage data protection for the entire enterprise from any computer connected to the Web.
8. Include open APIs. Rely on hardware and software solutions that support open application program interfaces (APIs) and industry standards.
9. Ensure cross-platform ability. Stay as flexible as possible by using a program that can work cross-platform with current and future servers, workstations, and desktops.
10. Include integrated managed archive ability. Managed archives are retrieved as easily as backed-up data files, thereby eliminating frantic tape searches or cross-referencing with manual tracking systems.

13.4.6 Legal considerations

There are numerous legal considerations for a new On Demand Business solution, including digital signatures, document retention, privacy, tax and customs relations, intellectual capital, banking regulations, accounting practices, and piracy.

This is not a complete end-to-end listing of all of the potential legal considerations that needs to be addressed, but it is a valid list to prepare for any legal issues that might need be to considered through the design process.

Digital signatures

Digital signatures now have the same legal status as handwritten signatures in the United States, in accordance with the passage of the Electronic Signatures in Global and National Commerce Act. Prior to the approval of this act, concerns about the legality and security of digital signatures had forced many companies and consumers to use hard copy contracts for some, if not all, of their online transactions.

The use of digital signatures creates additional opportunities for completing transactions, agreements, and approvals on the Web. For example, digital signatures can allow for quick and easy fund transfers, lower costs of acquiring clients, and the automation of entire transaction processes, such as procurement.

The legal acceptance of digital signatures means businesses and individuals will be able to finalize deals online with less time, cost, and effort. Reducing or eliminating printing and shipping costs is significant. But more important is the effort and time cut out of finalizing a contract.

Document retention

A document retention plan clearly states what to do with stored e-mail and online documents and what network procedures to consider in case of a court proceeding. Solution design needs to address this task when required.

Tax and customs relations

Shipping costs, trade laws, customs requirements, and taxes are just some of the issues that must be confronted in international e-commerce applications.

Researching the trade laws, tax, customs, and paperwork issues of countries where the solution will be deployed and used is very important. Even though many countries welcome trade, they all have restrictions on what goods they will accept from other countries. Some countries have complicated taxing structures that need to be understood. Almost every country requires the completion of numerous forms in order to conduct business with them.

A solid understanding of how taxes will impact the On Demand Business transformation can add value to the business strategies being implemented.

Intellectual capital

To preserve the value of client's intellectual capital, the design should include a Knowledge Management (KM) solution, which will protect the institutional expertise and makes it available within the organization.

KM solutions use a variety of technologies to provide an entry point to all of the knowledge that exists within an organization. KM solutions include document management and search solutions and organize information by subject and provide links to the experts within a company to the subject matter topics.

Banking regulations

In the United States, there is a growing sense among bankers that online payment companies should be regulated like banks. States typically require banks to keep much higher reserves of cash on hand than they do money transmitters to guarantee transactions and to keep closer tabs on transactions. Banks also have to comply with regulations governing security, privacy, and client disputes. A growing number of states have begun to update their laws to cover online payment services. State authorities have the power to shut down online payment services in their state or to fine those that offer services without a license. A consideration in the plan should be given to understanding the banking regulations for online business.

Accounting practices

As important as ever, an On Demand Business implementation needs to follow the existing business rules and objectives. These business rules include industry-wide and legal accounting practices.

License control

A software license control system should be included as part of the On Demand Business solution design. Selected license control system can offer protection from illegal copying and provide the business with the confidence that their intellectual property can only be used as specified by their terms.



Resources and tools for On Demand Business solution design

This chapter provides useful resources, links and materials for On Demand Business Solution Designer. Since the list of references is quite large, it is organized based on type of resources as well as key areas for On Demand Business solution design.

- ▶ Redbooks and other publications
- ▶ On Demand Business references
 - General
 - Assessment tools
 - Architecture and technologies
- ▶ On Demand Operating Environment capabilities
 - Business Integration
 - Infrastructure Management
- ▶ On Demand Business case studies/examples

14.1 Redbooks and other publications

This section lists Redbooks, Redpapers, and other publications that are available to help you design On Demand Business solutions.

14.1.1 Redbooks and Redpapers

There are several Redbooks and Redpapers available:

- ▶ *Selling Solutions for On Demand Business*, SG24-6330

This IBM Redbook serves as a practical reference for those who desire to understand the IBM On Demand Business strategy and how to sell effectively within it. It provides the perfect starting point for those who want to integrate On Demand Business concepts into their selling practice. It also serves as guide for anyone who is preparing to take the IBM Certified for On Demand Business Solutions Advisor Exam (Test 816).

By reading this IBM Redbook, you will understand the IBM On Demand Business strategy. You will be able to identify On Demand Business opportunities and target markets, as well as know how to sell solutions in line with the strategy. You will also have the ability to articulate and sell solutions that support On Demand Business. Plus, you will understand how to be more adaptive to the dynamics in the marketplace.

- ▶ *On Demand Operating Environment: Creating Business Flexibility*, SG24-6633

This Redbook provides an overview of the architecture of an On Demand Operating Environment and describes in detail the components that are required to create business flexibility through integration. To meet the business needs of being responsive, variable, focused, and resilient, an On Demand Operating Environment must be integrated, autonomic, virtualized, and open. Though these attributes are all interrelated, this redbook focuses on the integration component as the key enabler of business flexibility.

- ▶ *On Demand Operating Environment: Managing the Infrastructure*, SG24-6634

This IBM Redbook (along with its companion volume, *On Demand Operating Environment: Creating Business Flexibility*, SG24-6633), provides an insight into the kind of operating environment required to support an On Demand Business.

- ▶ *Virtualization and the On Demand Business*, REDP9115

This Redpaper describes how organizations can use virtualization as a technique to gain more business value and greater flexibility from their information technology (IT) infrastructure.

- ▶ *Patterns: SOA with an Enterprise Service Bus in WebSphere Application Server V6*, SG24-6494

The Patterns for On Demand Business are a group of proven, reusable assets that can be used to increase the speed of developing and deploying On Demand Business applications. This IBM Redbook focuses on how you can use the service-oriented architecture (SOA) profile of the Patterns for On Demand Business to implement an Enterprise Service Bus in WebSphere Application Server V6.

- ▶ *Patterns: Implementing an SOA using an Enterprise Service Bus*, SG24-6346

Many enterprises (large and small) are focused on increasing their business flexibility while simplifying their IT infrastructure in order to better meet their business objectives. The IBM On Demand Operating Environment (ODOE) defines a set of integration and infrastructure management capabilities that enterprises can use to achieve these challenging objectives. The ODOE features of particular relevance to this IBM Redbook are the use of a service-oriented architecture together with an Enterprise Service Bus. These are both necessary to achieve the goals of increased business flexibility and a

simplified IT infrastructure. Many of these enterprises are determined to use proven architectures, designs and product mappings in order to speed their implementation and minimize their risk.

- *Managing Information Access to an Enterprise Information System Using J2EE and Services Oriented Architecture*, SG24-6371

This IBM Redbook focuses on issues associated with the integration of an existing enterprise information system (EIS) into a new Java 2 Platform Enterprise Edition (J2EE), and other service-oriented applications. The book specifically discusses quality of service issues that are associated with the integration of geographically remote EIS. It describes how to use Web services, Java Message Service (JMS), and J2EE Connector Architecture (JCA) technologies in combination to enable access to existing transactions while addressing transport difficulties due to variable network conditions. It also addresses security context and transaction context propagation issues.

14.1.2 Books

The following books contain information about designing On Demand Business solutions:

- Lamb, et al, *IBM WebSphere and Lotus: Implementing Collaborative Solutions*, Pearson Education, 2004, ISBN 0131443305

This is a comprehensive guide to building collaborative solutions that integrate WebSphere and Lotus to drive maximum business value. Writing for experienced Web developers, three leading IBM consultants show how to design and deploy WebSphere and Domino together in any environment, no matter how large or complex. The authors address architecture, security, performance, availability, development, and much more. Using their techniques, you can implement cutting-edge collaboration, drive productivity improvements, streamline business processes, accelerate response times, and build your On Demand enterprise.

- Joseph, et al, *Grid Computing*, Prentice Hall Professional Technical Reference, 2003, ISBN 0131456601

- A business-focused guide to the grid computing revolution.
- Best practices, case studies, and resources from IBM experts.
- Drive unprecedented value from your existing IT investments.
- Simplify IT administration in heterogeneous environments.
- Build flexible, resilient infrastructures that deliver resources instantly.

- Fellenstein, *On Demand Computing: Technologies and Strategies*, Prentice Hall Professional Technical Reference, 2004, ISBN 0131440241

Leading IBM enterprise consultant Craig Fellenstein shows how to build On Demand Business infrastructure for integrating all your business processes, partners, suppliers, and clients. Drawing on consulting engagements with many of the world's largest organizations (and IBM's own processes), Fellenstein shows how to:

- Plan and migrate towards an On Demand Operating Environment
- How autonomic computing streamlines and simplifies IT service delivery, and dramatically improves business agility
- Use grid computing to deliver new business services more quickly, flexibly, and cost-effectively
- Leverage On Demand Business technologies to enter new global markets and become a world-class On Demand Business service provider

- Murch, *Autonomic Computing*, Prentice Hall Professional Technical Reference, 2004, ISBN 013144025X

IT operations costs are accelerating, and today's increasingly complex architectures and distributed computing infrastructures only make matters worse. The solution: autonomic computing. Autonomic systems are self-configuring, self-healing, self-optimizing, and self-protecting. They operate intelligently and dynamically, acting on your policies and service requirements. This book presents everything IT leaders and managers need to know to prepare for autonomic computing and to begin leveraging its benefits. Coverage includes:

- How autonomic computing can reduce costs, improve service levels, enhance agility, simplify management, and help deliver on demand business
 - The key elements and attributes of autonomic computing systems
 - Current autonomic technologies from IBM and many other leading suppliers
 - Autonomic computing architectures, open standards, development tools, and enablers
 - Implementation considerations, including a new assessment methodology
 - The future of autonomic computing: business opportunities and research challenges
- Cutlip, *Integrated Solutions with DB2*, Prentice Hall Professional Technical Reference, 2003, ISBN 0201754851

Learn how to seamlessly integrate DB2, Web servers, development tools, the messaging infrastructure, and other crucial technologies. Then build, step by step, five specific solutions chosen to address the core challenges facing today's enterprise. Along the way, you will learn how to use DB2 to improve productivity and client service, reduce operating costs, strengthen key trading relationships, and more.

- Leveraging the IBM Patterns for On Demand Business to accelerate the delivery of integrated, Web-enabled solutions
- Using DB2, WebSphere, and related technologies to integrate applications, information, and portals
- Exploiting business integration technologies to bring together people, processes, and information to create a cohesive solution
- Creating automated CRM e-mail systems with trigger-induced DB2 UDFs, JavaMail™, and JAF
- Building high-value mobile and pervasive applications with DB2 Everyplace and DB2 SpatialExtender (SE)
- Delivering dynamic Web services and eSourcing solutions with DB2 XML Extender
- Architecting and building highly personalized e-commerce systems with DB2 technologies

14.2 On Demand Business

This section provides references for On Demand Business in general, assessment tools, and architectures and technologies.

14.2.1 General references

General On Demand Business references are listed in this section:

- ▶ On Demand Business Home Page
<http://www-306.ibm.com/e-business/ondemand/us/index.html>
- ▶ On Demand Business – Executive Guide (PDF)
<http://t1d.www-306.cacheibm.com/e-business/ondemand/us/pdf/ExecGuide1214.pdf>
- ▶ On Demand Business – How to Get Started
<http://www-306.ibm.com/e-business/ondemand/us/howtogeton/howtogeton.shtml>
- ▶ Managing Business Transformation
<http://www-306.ibm.com/e-business/ondemand/us/overview/biztrans.shtml>
- ▶ Business Performance Management
http://www-1.ibm.com/services/ondemand/business/performance_management.html
- ▶ IBM Engineering and Technology Services
<http://www-03.ibm.com/technology/index.shtml>
- ▶ Legacy Transformation: Finding new business value in older applications
http://www-1.ibm.com/services/ondemand/business/legacy_transformation.html?SA_Message=tn+test
- ▶ Solutions from IBM Global Services for Business Issues
<http://www-1.ibm.com/services/us/index.wss/home/topics>

You will find information related to variety of solutions IBM offers for business issues:

- Boost workplace efficiency.
 - Build a flexible infrastructure.
 - Enhance financial management.
 - Enhance security, privacy and compliance.
 - Improve client experience.
 - Increase business innovation.
 - Manage human capital.
 - Optimize IT investments.
 - Optimize supply chains and operations.
 - Streamline business processes.
- ▶ Consulting Solutions from IBM Global Services
<http://www-1.ibm.com/services/us/index.wss/home/consulting>
- You will find information related to variety of consulting services IBM offers:
- Application innovation.
 - Business transformation outsourcing.
 - Center for Business Optimization.

- Client relationship management.
- Financial management.
- Human capital management.
- On Demand Innovation Services (ODIS).
- Strategy and Change.
- Supply chain management.
- IT Services Solutions from IBM Global Services
<http://www-1.ibm.com/services/us/index.wss/home/services>
 You will find information related to variety of consulting services IBM offers:
 - Application development and systems Integration.
 - Application management services.
 - Business continuity and recovery.
 - Customized training solutions.
 - Equipment buyback and disposal.
 - Infrastructure and systems management.
 - IT Performance.
 - Maintenance.
 - Networking.
 - Outsourcing/Hosting.
 - Packaged application implementation.
 - Security and privacy.
 - Service-oriented architecture.
 - Storage.
 - Technical support.
 - Wireless.

14.2.2 Assessment tools

This section provides references for information about On Demand Business assessment tools.

► Competitive Advisor

This Web-based expert system helps sellers identify validated leads and opportunities. It uses industry financial benchmarks to walk client executives through a four step process.

Use this tool when working with line of business and C-level (CEO, COO, CFO, and so on) executives, clients with 100 employees, and others. For more information, see:

http://www-1.ibm.com/partnerworld/pwhome.nsf/weblook/sel_spt_compadv_desc.html

► Automation assessment tool

To help you understand your organization's current automation capabilities and map key focus areas to enhance these capabilities, Tivoli software from IBM has created a comprehensive Automation Assessment tool. The tool measures your level of automation function against each of six functional areas within your IT environment.

Automation maturity levels:

- Basic
- Managed
- Predictive
- Adaptive
- Autonomic

Assessment categories:

- Security
- User Administration
- Performance and Capacity Management
- Solution Deployment
- Availability
- Problem Management

For more information about this tool, see:

<http://www-306.ibm.com/software/tivoli/resource-center/overall/dem-auto-tool.jsp>

► Virtualization Engine Planning Advisor

Before you implement the IBM Virtualization Engine in your enterprise, there are important ordering, planning, and deployment considerations to be made. The Virtualization Engine planning advisor is an interactive tool that produces customized planning output based on your needs. For more information, please refer to:

http://publib.boulder.ibm.com/infocenter/eserver/v1r1/en_US/index.htm?info/veinfo/planner.htm

► Grid Value at Work tool

Using templates and simulation modeling for financial calculations, this industry-leading, patent-pending tool and methodology draws on IBM Global Services' years of client engagements and can provide the analysis and road map you need to start small and grow with Grid computing. For more information, please refer to:

http://www-1.ibm.com/grid/about_grid/ibm_grid/products_services.shtml

► TCOnow!

CIOview is an independent tool vendor, so their TCOnow! Tools are based on independent data from IT experts, and can help you understand the full financial impact of your IT purchase decisions over a three, four, or five year period.

These simple to use tools guide you through a structured interview process covering virtually hundreds of cost data elements that span hardware, software, staff, facilities, services, maintenance, and even costs associated with downtime. For more information on this tool, see:

<http://www-1.ibm.com/servers/solutions/serverconsolidation/tco/approach.html>

14.2.3 Architecture and technologies

This section provides references for information about On Demand Business architecture and technologies.

- On Demand Operating Environment standards

This article describes the different layers and components that constitute the IBM On Demand Operating Environment, including how they relate to each other and how the operating environment builds on open standards for an increased business value proposition. For more information, please refer to:

<http://www-128.ibm.com/developerworks/xml/library/x-odstd/>

- Architecting an On Demand Business Solution

The articles in this series demonstrate to business analysts, Solution Designers, and architects how to design and implement On Demand Business solutions using the thirteen capabilities of the IBM On Demand Operating Environment. For more information, please refer to:

<http://www-106.ibm.com/developerworks/library/i-odoebp.html>

<http://www-106.ibm.com/developerworks/library/i-odoebp2/>

- Operating Environment Essentials for an On Demand Business breakthrough

This article provides an in-depth look at the On Demand Operating Environment, answering three primary questions: How do I achieve business flexibility within my infrastructure, allowing me to quickly evolve IT as business demands require? How do I simplify the way I manage the IT infrastructure? And how can I get started with small projects that take advantage of my existing IT assets? For more information, please refer to:

<http://www-128.ibm.com/developerworks/ibm/library/i-odoe2/>

- Service-oriented Design and Development

This article discusses transitioning to an SOA and Web services, key offerings for SOA, and Web services development. For more information, please refer to:

<http://www-306.ibm.com/software/info/developer/solutions/soadev/index.jsp>

- Migrating to a SOA

In this two-part article, authors discuss the case for developing a SOA, requirements for SOA, the nature of a service, addressing old problems, and the benefits of deploying SOA along with additional reference resources. For more information, please refer to:

<http://www-128.ibm.com/developerworks/webservices/library/ws-migratesoa/>

- developerWorks: SOA and Web Services

developerWorks home page for SOA and Web Services.

<http://www-130.ibm.com/developerworks/webservices/>

- Best Practices for Web Services

The articles in this series discuss the best practices for web services. The first part appeared in Oct 2002. For more information, please refer to:

- From <http://www-128.ibm.com/developerworks/webservices/library/ws-best1/>

- To <http://www-128.ibm.com/developerworks/webservices/library/ws-best12/>

- Transforming your business to on demand: IBM's approach to SOA

In this document, you will find IBM's approach to SOA. Service-oriented Architecture is the foundation of an On Demand Operating Environment. For more information, please refer to:

<http://www-1.ibm.com/services/us/bcs/pdf/soa-g224-7309-00-br58.pdf>

- Enterprise Service Bus

This link provides information related to Enterprise Service Bus: What is an ESB, key characteristics of ESB, the role of an ESB, and benefits of an ESB. For more information, please refer to:

<http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=landings/esbbenefits>

- Understand Enterprise Service Bus Scenarios and Solutions in Service-oriented Architecture.

<http://www-128.ibm.com/developerworks/webservices/library/ws-esbscen/>

<http://www-128.ibm.com/developerworks/webservices/library/ws-esbscen2.html>

14.3 On Demand Operating Environment: capabilities

The resources in this section are arranged based on the capabilities of the On Demand Operating Environment. Figure 14-1 shows the IBM On Demand Operating Environment capabilities. In this section, the resources and links are organized by the layout shown in this figure.

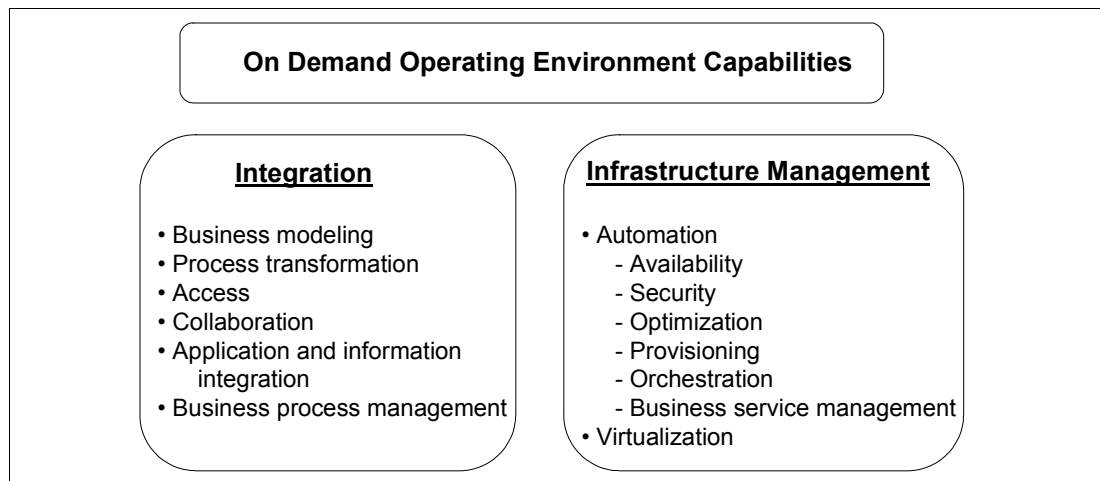


Figure 14-1 The capabilities of the On Demand Operating Environment

14.3.1 Integration

This section provides references that contain more information about ODOE Integration capabilities.

Business modeling and process transformation

Table 14-1 lists helpful resources for business modeling and process transformation.

Table 14-1 Business modeling and process transformation resources

Link name	URL	Description
Business Integration Home Page	http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=products/businessint	Business Integration home page that could serve as an entry point to business integration related IBM products and solutions.
Process Integration Home Page	http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=solutions/process	Pivotal site for IBM products, tools, and solutions related to process integration.
On Demand Business Process life cycle	http://www-128.ibm.com/developerworks/webservices/library/ws-odbsum.html	On Demand Business Process life cycle: Build reusable assets to transform an order processing system (Part 1 through 10).
WebSphere Business Integration Server Foundation	http://www-306.ibm.com/software/integration/wbisf/	Home page for WebSphere Business Integration Server Foundation (WBISF), which allows clients to create reusable services out of their existing Web services and packaged applications as well as combine services to link business processes with software applications.
WebSphere Information Integration Home Page	http://www-306.ibm.com/software/data/integration/	IBM WebSphere Information Integration provides a strategic framework to help clients speed new application deployment and control IT costs. It gives companies real-time, integrated access to business information: structured and unstructured, public and private, and mainframe and distributed.
WebSphere Information Integration (formerly DB2 Information Integration (developerWorks home page))	http://www-128.ibm.com/developerworks/db2/zones/db2ii/	IBM developerWorks' one stop shop page for all WebSphere Information Integration related topics, forums, tools, tutorials, downloads, and so on.

Link name	URL	Description
A technical tour of WebSphere Information Integration content edition	http://www-128.ibm.com/developerworks/db2/library/tech/article/dm-0502johnson/index.html	With WebSphere Information Integrator (II) Content Edition, you can access many different content repositories and workflow systems through a single, Java-based, bi-directional interface. This interface makes it easy for application developers to integrate those sources into new or existing enterprise applications. Get familiar with the newest member of the WebSphere Information Integrator portfolio by taking a “technical tour” of the robust, J2EE-based architecture and technology behind WebSphere II Content Edition, and find out how to integrate your enterprise applications with relevant content.
WebSphere Integration Adapters Home Page	http://www-306.ibm.com/software/integration/wbiadapters/	IBM WebSphere Business Integration Adapters allow clients to quickly and easily create integrated processes that exchange information between ERP, HR, CRM, and supply chain systems.
WebSphere Business Integrations Collaborations Home Page	http://www-306.ibm.com/software/integration/wbicollaborations/	IBM WebSphere Business Integration Collaborations provides pre-built solutions for business process automation. Application-independent Collaborations graphically define end-to-end processes and encapsulate basic integration and business rules for business processes.
WebSphere Business Integration Server home page	http://www-306.ibm.com/software/integration/wbiserver/	WebSphere Business Integration Server Version is the IBM business integration solution for process integration, workforce management, and enterprise application connectivity.
WebSphere Business Integration Monitor Home page	http://www-306.ibm.com/software/integration/wbimonitor/	IBM WebSphere Business Integration Monitor displays real-time information from a variety of environments to allow decisive business performance management and optimization.

Link name	URL	Description
WebSphere Business Integration Modeler home page	http://www-306.ibm.com/software/integration/wbimodeler/	WebSphere Business Integration Modeler is the next step in the IBM Modeling portfolio. This family of tools extends the capabilities of modeling, and delivers new OPEN Systems availability to the modeling world, working on ECLIPSE, and with the ability to generate Business Process Execution Language (BPEL).
WebSphere Integration Event Broker	http://www-306.ibm.com/software/integration/wbieventbroker/	IBM WebSphere Business Integration Event Broker (formerly WebSphere MQ Event Broker) lets you rapidly build a flexible, extensible, and secure infrastructure that leverages applications and devices across heterogeneous platforms.
WebSphere Integration Message Broker	http://www-306.ibm.com/software/integration/wbimessagebroker/	IBM WebSphere Business Integration Message Broker (formerly WebSphere MQ Integrator Broker) transforms and enriches in-flight information to provide a level of intermediation between applications that use different message structures and formats.
WebSphere Data Interchange	http://www-306.ibm.com/software/integration/wdi/	WebSphere Data Interchange integrates electronic data interchange (EDI) into the WebSphere business process, messaging, and Internet-based B2B capabilities. Supports optimized "any-to-any" transformation of EDI, XML, and record-oriented application data formats.
WebSphere MQ Workflow	http://www-306.ibm.com/software/integration/wmqwf/	IBM WebSphere MQ Workflow supports long-running business process workflows as they interact with systems and people. Automates and tracks business processes in accordance with business design.

Link name	URL	Description
WebSphere Interchange Server	http://www-306.ibm.com/software/integration/wbiserver/ics/	IBM WebSphere InterChange Server addresses the need for efficiency and flexibility in automating and synchronizing business activities executed across multiple applications as business processes.
Rational Unified Process (RUP)	http://www-306.ibm.com/software/awdtools/rup/	IBM Rational Unified Process, or RUP, is a configurable software development process platform that delivers proven best practices and a configurable architecture.
Rational Application Developer for WebSphere Software	http://www-306.ibm.com/software/awdtools/developer/application/index.html	Quickly design, develop, analyze, test, profile, and deploy Web, Web services, Java, J2EE, and portal applications with this comprehensive IDE. Optimized for IBM WebSphere software, and supporting multi-vendor runtime environments, IBM Rational Application Developer for WebSphere Software is powered by the Eclipse open source platform so developers can adapt and extend their development environment to match their needs and increase their productivity.
<i>Rapid Application Development with Rational and WebSphere Studio, G325-1122</i>	http://www3.software.ibm.com/ibmdl/pub/software/rational/web/whitepapers/wp-radrd-medres.pdf	This PDF describes how IBM WebSphere Studio and IBM Rational Developer products help speed up both the adoption of Java and J2EE for IT shops new to the technologies and the development process for shops already well-versed in Java technologies.

Link name	URL	Description
IBM Rational Software Development Platform	http://www-306.ibm.com/software/info/developer/techvalue.jsp?S_TACT=104AHW36&S_CMP=campaign	The IBM Rational Software Development Platform is a proven, open, complete, and modular solution that helps teams build, integrate, extend, modernize, and deploy software and software-based systems. The IBM Rational Software Development Platform combines integrated development tools with proven best practices and processes guidelines. Organizations can create sustainable and defensible differentiation by aligning their software development teams with the needs of IT operations and line of business organizations.
Rational Application Developer (developerWorks home page)	http://www-128.ibm.com/developerworks/rational/products/rad/	IBM developerWorks' one stop shop page for all Rational Application Developer related topics, forums, tools, tutorials, downloads, and so on.
WebSphere Studio Integration Edition	http://www-306.ibm.com/software/integration/wsadie/	WebSphere Studio Integration Edition extends and integrates your existing IT assets using a next generation integration development environment optimized for building composite applications that deploy to IBM WebSphere Business Server Foundation.

Link name	URL	Description
<i>Effective Business Modeling with UML</i>	http://www-128.ibm.com/developerworks/rational/library/content/03July/2000/2256/2256_PWN.pdf	<p>This PDF addresses the following concerns:</p> <ul style="list-style-type: none"> ▶ When do I really need a business model? ▶ When are use-case models alone sufficient? ▶ Which UML diagrams should I use for particular business modeling situations? ▶ How do I know whether to use a sequence diagram or a collaboration diagram, for example? ▶ How does the UML business model relate to other UML models (domain model, use-case model, etc.)? ▶ How should I organize these models?

Business process management

Table 14-2 lists helpful resources for business process management.

Table 14-2 Business process management resources

Link name	URL	Description
Architecting On Demand Business solutions, Part 3: Use BPEL to create business processes	http://www-106.ibm.com/developerworks/library/i-odoebp3/	<p>This article examines a number of patterns that you can follow to design and implement your business processes. Using a business scenario, it illustrates how to choreograph intra-enterprise and inter-enterprise services. Business rules are used in the context of the business process so that you can make changes dynamically without affecting the application.</p>

Link name	URL	Description
Automating business processes and transactions in Web services: An introduction to BPELWS, WS-Coordination, and WS-Transaction	http://www-106.ibm.com/developerworks/webservices/library/ws-autobp/	The new Business Process Execution Language for Web Services, WS-Transaction, and WS-Coordination specifications provide a comprehensive business process automation framework that allows companies to leverage the power and benefits of the Web Services Architecture to create and automate business transactions. Here we present a high level executive overview of what the three new specifications provide.
BPEL V1.1 specs home and related links	http://www-128.ibm.com/developerworks/library/specification/ws-bpel/	BPEL4WS provides a language for the formal specification of business processes and business interaction protocols. By doing so, it extends the Web Services interaction model and enables it to support business transactions. BPEL4WS defines an interoperable integration model that should facilitate the expansion of automated process integration in both the intra-corporate and the business-to-business spaces.
<i>BPEL4WS Business Processes with WebSphere Business Integration: Understanding, Modeling, Migrating, SG24-6381</i>	http://www.redbooks.ibm.com/redpieces/abstracts/sg246381.html	This IBM Redbook introduces the industry open standard for business processes: Business Process Execution Language for Web Services (BPEL4WS), focusing on the use of BPEL4WS throughout the WebSphere Business Integration product set.
<i>Business process choreography in WebSphere: Combining the power of BPEL and J2EE</i> (IBM Research Journal article)	http://www.research.ibm.com/journal/sj/432/kloppmann.html	This IBM Research article discusses WebSphere Application Server's process choreographer environment, and how the extension mechanism built into BPEL can be used to leverage the additional capabilities of J2EE and WebSphere.

Link name	URL	Description
WebSphere Business Integration Server Foundation Process Choreographer (developerWorks home page)	http://www-128.ibm.com/developerworks/websphere/zones/was/wpc.html	IBM WebSphere Application Server Enterprise Process Choreographer provides support for business-process applications within the WebSphere Application Server. Business processes can be automatic, recoverable processes, or processes that require human interaction. With Process Choreographer, you can combine business process technology with any other service offered by products supporting the open J2EE architecture.
WebSphere Business Integration Server Foundation	http://www-306.ibm.com/software/integration/wbisf/	Home page for WebSphere Business Integration Server Foundation (WBISF), which allows clients to create reusable services out of their existing Web services and packaged applications as well as combine services to link business processes with software applications.

Access and collaboration

Table 14-3 lists helpful access and collaboration resources.

Table 14-3 Access and collaboration resources

Link name	URL	Description
IBM On Demand Business Workplace home page	http://www-1.ibm.com/services/us/index.wss/offerfamily/igs/a1001733	IBM On Demand Business Workplace is a comprehensive suite of software, hardware, services, and expertise that creates an environment where people dynamically interact with integrated business processes, other employees, partners, suppliers, and clients. IBM On Demand Business Workplace simplifies employee access to content, applications, people, and processes. It includes an enterprise wide portal designed to enable people to do their work from virtually anywhere, at anytime, faster and more effectively.

Link name	URL	Description
<i>Developing an On Demand Business Workplace: Bring order to chaos through integration and aggregation</i> (developerWorks six part article home page)	http://www-106.ibm.com/developerworks/ibm/library/i-workplace.html	In this 15 part article, the IBM On Demand Solution Center team takes you through the development of an On Demand Workplace for a fictitious company called International Food and Beverages. Stay with them as they introduce you to International Food and Beverages, identify their business problems, and then design and develop a workplace solution using IBM Patterns for On Demand Business, IBM products and tools, and open standards-based technologies, including Java, XML, and wireless.
IBM Workplace Collaboration Services	http://www.lotus.com/products/product5.nsf/wdocs/workplacehome	IBM Workplace Collaboration Services is a single product that provides a full range of integrated ready-to-use communication and collaboration tools that enable people to do their jobs more effectively anytime, anywhere.
<i>IBM Workplace Collaboration Services Overview</i> (PDF)	ftp://ftp.lotus.com/pub/lotusweb/IBM_Workplace_Collaboration_Services_g224733301_118.pdf	Overview guide: IBM WorkPlace Collaboration Services.
<i>IBM Workplace Collaboration Services Executive brief</i> (PDF)	ftp://ftp.lotus.com/pub/lotusweb/workplace/WCS_Exec_Brief.pdf	Workplace Collaboration Services offers a choice of client experiences that ranges from a standard Web browser to a server-managed rich client (licensed separately) that is built on innovative IBM Workplace Client Technology software. And, with a network-centric delivery model, administrators can deploy client software securely and more efficiently by not having to touch the desktop. With a single administration and policy management model, managing the applications and tools people need is simplified, helping to free up staff to work on value-add projects, as opposed to software installation and upgrades.

Link name	URL	Description
Lotus, IBM Workplace and Portal Products page at a glance	http://www.lotus.com/lotus/general.nsf/wdocs/lotusproducts	Pivotal page that could serve has a single point link to all Lotus, WebSphere Portal, and WorkPlace products.
<i>IBM Workplace, WebSphere portal and Lotus Software product portfolio guide</i> (PDF)	ftp://ftp.lotus.com/pub/lotusweb/products/Product_Portfolio_Guide.pdf	Lotus, WebSphere Portal, and WorkPlace Product Portfolio guide.
WebSphere Portal	http://catalog.lotus.com/wps/portal/portal	IBM WebSphere Portal Solutions Catalog.
<i>Portal Composite Pattern Using IBM WebSphere Portal V5</i> , SG24-6087	http://publib-b.boulder.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg246087.html?Open	The Patterns for On Demand Business are a group of proven, reusable assets that can speed the process of developing applications. The Portal Composite Pattern combines Business and Integration patterns to help implement a portal solution. This is an update of the IBM Redbook <i>A Portal Composite Pattern Using WebSphere V4.1</i> , SG24-6869, and is based on WebSphere Portal V5. This IBM Redbook updates the Portal composite, Application, and Runtime patterns and Product mappings, and provides design for building Portal solutions.
WebSphere Portal Zone (developerWorks home page)	http://www-128.ibm.com/developerworks/websphere/zones/portal/	IBM developerWorks' one stop shop page for all WebSphere Portal related topics, forums, tools, tutorials, downloads, and so on.
<i>WebSphere Portal Server and DB2 Information Integrator: A Synergistic Solution</i> , SG24-6433	http://publib-b.boulder.ibm.com/redbooks.nsf/RedpieceAbstracts/sg246433.html?Open	This IBM Redbook provides examples of the synergy between WebSphere Portal Server and DB2 Information Integrator in delivering portal solutions, and will include sample portlets exploiting SQL, UDFs, JDBC™, and Web Services.

Link name	URL	Description
IBM Lotus Domino	http://www.lotus.com/products/product4.nsf/wdocs/dominohomepage	IBM Lotus Domino server software combines enterprise-class messaging and calendar/ scheduling capabilities with a robust platform for collaborative applications on a wide variety of operating systems. The Lotus Domino Server is available in three offerings: Domino Messaging Server (messaging only), Domino Utility Server (applications only), and Domino Enterprise Server (both messaging and applications).

Application and information integration

Table 14-4 lists helpful application and information integration resources.

Table 14-4 Application and information integration resources

Link name	URL	Description
Information Integration Home Page	http://www-306.ibm.com/software/data/integration/	IBM WebSphere Information Integration provides a strategic framework to help clients speed new application deployment and control IT costs. It gives companies real-time, integrated access to business information: structured and unstructured, public and private, and mainframe and distributed.
WebSphere Information Integrator: Partner Solutions	http://www-306.ibm.com/software/data/integration/partners.html	This site illustrates the emerging partner ecosystem around WebSphere Information Integrator, followed by the listing of our tested partner solutions.
WebSphere Information Integrator formerly DB2 Information Integrator	http://www-306.ibm.com/software/data/integration/db2ii/	WebSphere Information Integrator is designed to meet a diverse range of data integration requirements for business intelligence and business integration. It provides a range of capabilities: <ul style="list-style-type: none"> ▶ Enterprise search ▶ Data federation ▶ Data transformation ▶ Data placement ▶ Data event publishing

Link name	URL	Description
<i>WebSphere Portal Server and DB2 Information Integrator: A Synergistic Solution</i> , SG24-6433	http://publib-b.boulder.ibm.com/redbooks.nsf/RedpieceAbstracts/sg246433.html?Open	This IBM Redbook provides examples of the synergy between WebSphere Portal Server and DB2 Information Integrator in delivering portal solutions, and will include sample portlets exploiting SQL, UDFs, JDBC, and Web Services.
Getting started with WebSphere Information Integrator	http://www-128.ibm.com/developerworks/db2/newto/db2ii-getstarted.html	Contains WebSphere Integrator related information organized in five steps, including overview, details, capabilities, development, and educational resources.
Application Integration home page	http://www-306.ibm.com/software/inf01/websphere/index.jsp?tab=solutions/appintegration&S_TACT=103BGW01&S_CMP=campaign	The Application Integration home page could serve as an entry point to application integration IBM products and solutions.
<i>Getting Starting on Integrating Your Information</i> , SG24-6892	http://www.redbooks.ibm.com/abstracts/sg246892.html	This redbook will help architects and implementers to understand the integration technologies in DB2 Universal Database™ and DB2 Information Integrator and to start implementing information integration solutions.
Extending Portals with DB2 Information Integrator	http://www-106.ibm.com/developerworks/db2/library/techarticle/dm-0402saracco/	Using Enterprise Information Integration (EII) technology with Web portals can extend the reach of pre-built components and make it easier to develop custom components. In this article, we will explain why, as well as show you how to get off to a quick start.
Building Portals with Enterprise Information Technology	http://www-128.ibm.com/developerworks/db2/library/techarticle/dm-0403saracco/index.html	This article will explain why using Enterprise Information Integration Technology to develop portal application components that integrate data from disparate sources can simplify design issues and cut coding requirements by 50 percent or more. It will also review a project in which we build functionally equivalent portal components with and without EII.

Link name	URL	Description
WebSphere Information Integrator Q Replication	http://www-128.ibm.com/developerworks/db2/library/tech/article/dm-0503aschoff/	With the release of IBM WebSphere Information Integrator 8.2, IBM delivered a major advancement in database replication through a function called queue replication, or Q replication. The new replication architecture has emerged from the need for high performance: high transaction volume combined with low latency. In this article, discover the new Q replication architecture, what levels of performance to expect, and what factors influence that performance. Also, learn from examples drawn from laboratory measurements on both AIX and z/OS platforms
A Technical Tour of WebSphere Information Integrator Content Edition	http://www-128.ibm.com/developerworks/db2/library/tech/article/dm-0502johnson/	With WebSphere Information Integrator (II) Content Edition, you can access many different content repositories and workflow systems through a single, Java-based, bi-directional interface. This interface makes it easy for application developers to integrate those sources into new or existing enterprise applications. Get familiar with the newest member of the WebSphere Information Integrator portfolio by taking a “technical tour” of the robust, J2EE-based architecture and technology behind WebSphere II Content Edition, and find out how to integrate your enterprise applications with relevant content.
Developing a business integration solution for Domino with WebSphere Application Server	http://www-128.ibm.com/developerworks/lotus/library/l5-dwbi-was3/index.html	Part three of this series about Domino and WebSphere business integration dives into the technical details of how to build a business application solution using the WebSphere Application Server and the WebSphere Business Integration Adapter for Domino.

Link name	URL	Description
Developing a business integration solution for Domino with WebSphere InterChange Server	http://www-128.ibm.com/developerworks/lotus/library/dwbi-wics2/	Part two of this series about Domino and WebSphere Business Integration dives into the technical details of how to build a business application solution using the WebSphere InterChange Server and the WebSphere Business Integration Adapter for Domino.
Integrate enterprise applications with Web services and J2EE	http://www-128.ibm.com/developerworks/webservices/library/ws-eai/index.html	In this article, Andre Tost and Daniela Rudrof offer a vision of how J2EE and Web services can work together to ease enterprise application integration (EAI). You will see how the Java Messaging Service and the Java 2 Connector Architecture can be used in tandem with Web services technologies to bring the integration process to a new level of abstraction.
Integrating Technology and Business Solutions through IBM WebSphere Business Integration Adapters	http://www-128.ibm.com/developerworks/websphere/library/techarticles/0403_adimurthy/0403_adimurthy.html	This article demonstrates the role of WebSphere Business Integration Adapters to the technical and business community by showing the integration capabilities of the WebSphere Business Integration Adapter for Lotus Domino in a WebSphere MQ Message Broker environment. It includes an overview of the adapter, client usage scenarios, Lotus Domino business objects, configuration properties, initialization, termination, event handling, and log and trace functionality.
<i>Patterns: Serial Process Flows for Intra- and Inter-enterprise, SG24-6305</i>	http://www.redbooks.ibm.com/redpieces/abstracts/sg246305.html	The IBM Patterns for On Demand Business are a group of proven, reusable assets. They increase the speed of developing and deploying Web applications. This IBM Redbook focuses on advanced application integration using the Process-focused Application Integration: Serial Process Application pattern for intra-enterprise, and the Extended Enterprise: Exposed Serial Process Application pattern for inter-enterprise.

Link name	URL	Description
Lotus Domino and IBM WebSphere Integration Solutions: Domino XML	http://www-128.ibm.com/developerworks/lotus/library/dwintegration-dxl/	Manage your data in Lotus Domino, but take advantage of IBM WebSphere's highly scalable, transactional J2EE platform using one of these solutions: Domino XML or Domino JSP™ tag libraries. In part one of this series, we focus on Domino XML or DXL
<i>Portalizing Domino Applications: Integration with Portal 5.02 and Lotus Workplace 2.0.1</i> , SG24-6466	http://www.redbooks.ibm.com/abstracts/SG246466.html?Open	This IBM Redbook provides an overview of the options and techniques for integrating and “portalizing” Domino applications into WebSphere Portal and Lotus Workplace. For each of the integration options, we provide an overview of the technology, an introduction to the software and tools used, and step-by-step examples of using the techniques to portalize a sample Domino application.
<i>WebSphere Business Integration Server Express The Express Route to Business Integration</i> , SG24-6353	http://www.redbooks.ibm.com/redpieces/abstracts/sg246353.html	This IBM Redbook provides guidance for IT specialists and architects who are implementing enterprise application integration (EAI) projects for small and medium businesses. It provides best practices and advice for all levels of an EAI solution, including design, implementation, and deployment using the WebSphere Business Integration Server Express.
WebSphere Integration Adapters Home Page	http://www-306.ibm.com/software/integration/wbiadapters/	IBM WebSphere Business Integration Adapters allow clients to quickly and easily create integrated processes that exchange information between ERP, HR, CRM, and supply chain systems.

14.3.2 Infrastructure management

Infrastructure Management and Services, the second entry point or pillar of an On Demand Environment transforms your IT environment into a standards-based, integrated, automated, and virtualized platform.

- On Demand Automation.

This Tivoli home page for infrastructure automation has several resources related to Infrastructure Management automation solutions to enable On Demand Business.

<http://www-306.ibm.com/software/tivoli/features/may2004/>

- Implement a better way to manage IT in alignment with business goals.

This 12-page executive brief to discover how IBM's approach to infrastructure management can help you.

<http://www-306.ibm.com/software/tivoli/resource-center/availability/eb-infra-mgmt.jsp>

- Technical Resources for Tivoli software and security products.

<http://www-136.ibm.com/developerworks/tivoli/>

- Redbooks related to Tivoli Infrastructure Management.

<http://publib-b.boulder.ibm.com/Redbooks.nsf/portals/TivoliRedbooks>

The following sections include resources organized by the seven infrastructure capabilities of an On Demand Operating Environment.

Availability

Table 14-5 lists helpful availability resources.

Table 14-5 Availability resources

Link name	URL	Description
IBM Tivoli Availability Solutions Home page	http://www-306.ibm.com/software/tivoli/solutions/availability/index.html	Ensuring peak performance and availability cost efficiently through intelligent management software solutions from Tivoli will help you meet and exceed both internal and external service level agreements and reduce total cost of ownership. This Tivoli availability home page includes a comprehensive list of availability related products, solutions, and useful information.

Link name	URL	Description
Availability Management Buyers Guide	http://www-306.ibm.com/software/tivoli/resource-center/availability/bg-availability.jsp	<p>How can you identify the availability management solution that is right for your organization? This eight-page buyer's guide can help. It provides you with:</p> <ul style="list-style-type: none"> ▶ Key criteria that distinguish leading solutions that you should look for as you evaluate potential purchases. ▶ Business benefits that potential solutions should be able to deliver to your organization. ▶ Vendor capabilities that help you meet your needs both now and in the future.
<i>Availability Management Solutions Buyer's Guide: Purchasing Criteria</i>	ftp://ftp.software.ibm.com/software/tivoli/buyers-guides/bg-availability.pdf	This is an eight-page buyer's guide. An ideal availability management solution helps you collect and analyze information from across your IT infrastructure. Discover the key criteria you should look for in a solution and from the vendor that provides it.
IBM developerWorks Availability home page	http://www-128.ibm.com/developerworks/tivoli/availability/	One stop shop technical resources home page for availability related products and solutions.
Understanding High Availability with WebSphere MQ	http://www-128.ibm.com/developerworks/websphere/library/techarticles/0505_hiscock/0505_hiscock.html	This article helps you understand the pros and cons of the possible high availability solutions and will help you decide which solution is right for you.
An Overview of High Availability and Disaster Recovery for DB2 UDB	http://www-128.ibm.com/developerworks/db2/library/techarticle/0304wright/0304wright.html	High availability of data and the ability to recover from disaster are key requirements for critical database systems. This article summarizes the features in DB2 UDB that provide these capabilities and lets you know the pros and cons so you can decide which method is best for you.

Link name	URL	Description
High Availability Middleware on Linux, Part 1 through 5	http://www-128.ibm.com/developerworks/linux/library/1-halinux/	In this first of five articles, learn what it means for software to be highly available and how to install and set up heartbeat software from the High Availability Linux project on a two-node system.
<i>High Availability Scenarios with IBM Tivoli Workload Scheduler and IBM Tivoli Framework, SG24-6632</i>	http://www.redbooks.ibm.com/abstracts/SG246632.html?open	This redbook is intended to be used as a major reference for designing and creating highly available IBM Tivoli Workload Scheduler and Tivoli Framework environments.

Security

Table 14-6 lists helpful security resources.

Table 14-6 Security resources

Link name	URL	Description
IBM Tivoli Security Solutions home page	http://www-306.ibm.com/software/tivoli/solutions/security/index.html	This Tivoli Security home page includes a comprehensive list of availability related products, solutions, and other useful information.
<i>Providing Highly Secure Access to Information across Government Organizations</i>	ftp://ftp.software.ibm.com/software/tivoli/whitepapers/wp-secure-access-gov.pdf	Provides solution patterns illustrating how government-solution IT architects can design and integrate solutions to provide highly secure access to information between government organizations, businesses, and citizens
Buyers Guide to Identity Management	http://www-306.ibm.com/software/tivoli/resource-center/security/bg-ident-mgmt.jsp?S_TACT=103BGW01&S_CMP=campaign&ca=103BAW0N	The Buyer's Guide for Identity Management demonstrates how IBM Tivoli Identity Manager provides a automated, policy-based solution that helps reduce costs, increase efficiencies, and rapidly realize ROI by bringing users, systems, and applications online quickly.
Security for integration	http://www-306.ibm.com/software/tivoli/solutions/security/integration.html	Organizes resources that would help solution security requirements for integration projects involving Siebel and WebSphere.

Link name	URL	Description
Identity Management home page	http://www-306.ibm.com/software/tivoli/solutions/identity-mgmt/	<p>To effectively manage internal users as well as an increasing number of clients and partners through the Internet, IBM Tivoli provides the only integrated solution that addresses all four key areas of identity management:</p> <ul style="list-style-type: none"> ► Identity life cycle management (user self-care, enrollment, and provisioning) ► Identity control (access and privacy control, single sign-on, and auditing) ► Identity federation (sharing user authentication and attribute information between trusted Web services applications) ► Identity foundation (directory, directory integration, and workflow) <p>This URL leads you to all the security related products and solutions including Tivoli Access Manager suite of products, Tivoli Directory Server, Tivoli Identity, Privacy, and Security Compliance Manager.</p>
IBM developerWorks Security home page	http://www-128.ibm.com/developerworks/tivoli/security/	One stop shop technical resources home page for security related products and solutions.
<i>How Tivoli and WebSphere Work Together</i>	http://www-306.ibm.com/software/tivoli/resource-center/security/wp-access-websphere.jsp?S_TACT=104CB62&ca=104CB62	This whitepaper discusses deployment and automation identity management across your enterprise
Security Event Management	http://www-306.ibm.com/software/tivoli/solutions/securityevent/	The IBM Tivoli security event management solution helps you actively monitor IT resources across your organization, filter and correlate events, and automate responses to security incidents. This home page provides hooks to products and solutions that will enable you to proactively manage and handle security threats.

Optimization and resource virtualization

Table 14-7 lists helpful optimization and resource virtualization resources.

Table 14-7 Optimization and resource virtualization resources

Link name	URL	Description
Architecture for Virtualization with WebSphere Application Server Version 5	http://www-106.ibm.com/developerworks/websphere/library/techarticles/hvws/virtualization.html	Virtualization enables a collection of computing resources to be shared and managed as if they were one large virtual resource. A virtualized environment makes the most efficient use of its resources by sharing resources and providing what is needed only when it is needed. Not only are resources highly used, excess capacity can easily be used for new or unexpected needs. This paper explores the topic of a virtualized application server environment.
Tivoli Resource Center for Storage and Optimization	http://www-306.ibm.com/software/tivoli/resource-center/storage/index.jsp	Find analyst reports, articles, brochures, buyer's guides, case studies, CDs, downloadable code, datasheets, demonstrations, eNewsletters, flyers, news, presentations, Redbooks and more on Tivoli Storage and Optimization solutions at this site.
IBM Total Storage Virtualization Interactive demos	http://www-306.ibm.com/software/tivoli/resource-center/storage/dem-storage-virt.jsp	To help guide you through IBM TotalStorage Virtualization, this link contains several presentations that will give you details about the various solutions within the family. These vary from high-level overviews to more technical and detailed pieces.
IBM developerWorks home page for storage & optimization	http://www-306.ibm.com/software/tivoli/solutions/storage/	The IBM TotalStorage Open Software Family is a comprehensive, flexible storage software solution that can help enterprises address these storage management challenges today. This link introduces the family of products via an interactive image map that allows you to learn more about the specific components within the IBM TotalStorage Open Software Family that can help you create a more responsive resilient storage infrastructure for your On Demand Business.

Link name	URL	Description
Virtualization home page	http://www-306.ibm.com/software/tivoli/solutions/virtualization/	Storage virtualization software is designed to improve the flexibility and utilization of your storage. Virtualization works by pooling your storage volumes, files, and file systems into a single reservoir of capacity for centralized management. This reservoir can include storage capacity from multiple vendors and platforms in heterogeneous environments. Virtualization is also designed to reduce the effects of reconfigurations and at the hardware level, to help support business continuity.
Products list	http://www-306.ibm.com/software/tivoli/solutions/storage/products.html	Storage, optimization, and virtualization product list.
Self-optimizing Storage Allocation: Using Tivoli Storage Resource Manager with ESS	http://www-106.ibm.com/developerworks/edu/i-dw-tv-self-optstor-i.html?S_TACT=104AHW14&=TDD	With applications and data consuming growing amounts of space, a storage administrative staff spends an increasing amount of time allocating new storage. Tivoli Storage Resource Manager and ESS deliver self-optimizing capabilities with their LUN provisioning capabilities, which can extend file systems and provision LUNs as new storage is needed. The intent with this automation in place is to spend less time allocating storage and more time actively managing storage. This tutorial describes the automation options offered by ESS and IBM Tivoli Storage Resource Manager.
IBM Tivoli Storage Optimizer for zOS	http://www-306.ibm.com/software/tivoli/products/storage-optimizer-zos/	If you thought autonomic computing were merely buzzwords and realizing the promise of benefits was somewhere off in the distant future, think again and consider IBM Tivoli Storage Optimizer for z/OS. With this product, IBM immediately accelerates the autonomic evolution to a new level of automatic self-healing and self-optimizing storage management software for enterprises running on the z/OS platform.

Infrastructure orchestration and provisioning

Table 14-8 lists helpful infrastructure orchestration and provisioning resources.

Table 14-8 Infrastructure orchestration and provisioning resources

Link name	URL	Description
Orchestration and Provisioning Management home page	http://www-306.ibm.com/software/tivoli/solutions/orchestration-provisioning-management/	One stop shop technical resources home page for Infrastructure Orchestration and Provisioning related products and solutions.
IBM Tivoli Intelligent Orchestrator	http://www-306.ibm.com/software/tivoli/products/intell-orch/	IBM Tivoli Intelligent Orchestrator helps you to improve return of IT assets and increase server utilization. It helps boost server-to-administrator ratios by automatically triggering the provisioning, configuration, and deployment of a solution into production. This automated process supports servers, operating systems, storage, middleware, applications, and network devices. By utilizing existing hardware, software, and network devices without rewiring, you can minimize implementation times and achieve a faster return on investment.
IBM Orchestration and Provisioning Automation Library	http://www.developer.ibm.com/isv/tivoli/workflow.html	The IBM Orchestration and Provisioning Automation Library delivers the tools and community you need to build your business around On Demand Business automation. By building IT service management workflows, your application or network device can leverage IBM Tivoli orchestration and provisioning technologies.
Technology Infrastructure - IBM Tivoli Intelligent Orchestrator and IBM Tivoli Provisioning Manager: a Butler Group report	ftp://ftp.software.ibm.com/software/tivoli/analystreports/ar-orch-prov-butler.pdf	Technology Audit of IBM Tivoli and Tivoli Intelligent Orchestrator and Tivoli Provisioning Manager by the Butler Group.
IBM developerWorks Orchestration home page	http://www-128.ibm.com/developerworks/tivoli/orchestration/	Orchestration related technical resources portal.
IBM developerWorks Provisioning home page	http://www-128.ibm.com/developerworks/tivoli/provisioning/	Provisioning related technical resources portal.

Link name	URL	Description
IBM Tivoli Provisioning Manager home page	http://www-306.ibm.com/software/tivoli/products/prov-mgr/	IBM Tivoli Provisioning manager enables On Demand Business computing across the entire datacenter through software, server, storage, and network automation.
IBM Tivoli Provisioning Manager Functional highlights	http://www-306.ibm.com/software/tivoli/products/prov-mgr/function-highlights.html	<p>Functional highlights of how IBM Tivoli Provisioning Manager:</p> <ul style="list-style-type: none"> ► Helps reduce costs, improve server utilization, and boost server-to-administrator ratios by automating all the steps necessary to provision, configure, and deploy your complete IT environment into productive use. ► Protects your existing investments, lowers implementation costs, and creates a rapid return on investment by utilizing existing hardware, software, storage, and network devices without rewiring or changing the network architecture.
On Demand Automation Catalog	http://www-18.lotus.com/wps/portal/automation/	Automation packages for IBM Tivoli Provisioning Manager and IBM Tivoli Intelligent Orchestrator.
IBM IT Service Management Automation package	http://www-306.ibm.com/software/tivoli/features/opal/	IBM Orchestration and Provisioning Automation Library (OPAL) details.
<i>Developing Workflows and Automation Packages for IBM Tivoli Intelligent Orchestrator, SG24-6057</i>	http://www.redbooks.ibm.com/redbooks/pdfs/sg246057.pdf	Developing Workflows and Automation Packages for IBM Tivoli Intelligent Think Dynamic Orchestrator.
Orchestration and Provisioning Products home	http://www-306.ibm.com/software/tivoli/solutions/orchestration-provisioning-management/products.html	Complete list of all the Orchestration and Provisioning products.

Business Service Management

Table 14-9 lists helpful business service management resources.

Table 14-9 Business service management resources

Link name	URL	Description
Business Service Management home page	http://www-306.ibm.com/software/tivoli/solutions/bsm/	One stop shop technical resources home page for Business Service Management related products and solutions.
IBM Tivoli Business Systems Manager	http://www-306.ibm.com/software/tivoli/products/bus-sys-mgr/	IBM Tivoli Business Systems Manager is part of the IBM Tivoli Business Service Management portfolio of products that provides intelligent management software to help businesses increase operational agility by aligning IT operations to business priorities. This link discusses in detail the features, advantages, and benefits of IBM Tivoli Business Systems Manager.
<i>Tivoli Business Systems Manager V2.1 End-to-end Business Impact Management, SG24-6610</i>	http://publib-b.boulder.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg246610.html?Open	This IBM Redbook gives a broad understanding of the IBM Tivoli Business Systems Manager architecture and internals. The in-depth discussion covers the product's inner workings and includes log files to illustrate the processing of its various components.
Evolving Organizations and Managing IT Services for Profitability	http://www-306.ibm.com/software/tivoli/resource-center/bsm/ar-manage-it-serv-ema.jsp	Written by Enterprise Management Associates (EMA), this whitepaper describes how IBM Tivoli Service Level Advisor includes both the processes and software that deliver an over-arching view of how to create affordable, high quality, and client satisfying IT services.
Tivoli Service Level Advisor	http://www-306.ibm.com/software/tivoli/products/service-level-advisor/	IBM Tivoli Service Level Advisor is part of the IBM Tivoli Business Service Management portfolio of products that provides intelligent management software to help businesses increase operational agility by aligning IT operations to business priorities. This link discusses in detail the features, advantages, and benefits of Tivoli Service Level Advisor.

Link name	URL	Description
Service Management and Business Priorities	http://www-306.ibm.com/software/tivoli/resource-center/bsm/ar-itol-slm-ema.jsp?S_TACT=104CB62&ca=104CB62	This Enterprise Management Associates (EMA) analyst report "Service Management and Business Priorities" discusses, in detail, IT service management
Tivoli Service Level Management for the Insurance Industry demo	http://www-306.ibm.com/software/tivoli/resource-center/bsm/dem-serv-level-mgmt.jsp	This demonstration shows how IBM Tivoli Business Systems Manager and Service Level Advisor work in conjunction with IBM WebSphere Business Integration Modeler to monitor performance and diagnose problems in an automated insurance claims processing workflow.
Tivoli Enterprise Console	http://www-306.ibm.com/software/tivoli/products/enterprise-console/	A failure in a single component, such as a database, can quickly cause entire business systems to fail, generating many symptomatic alerts from multiple downstream components. The resulting confusion can cause wasted time and effort. This link leads you to the home page for IBM Tivoli Enterprise Console, which provides sophisticated, automated problem diagnosis and resolution to improve system performance and reduce support costs.
Leveraging Best Practices	ftp://ftp.software.ibm.com/software/tivoli/whitepapers/wp-bsm-sla.pdf	Leverage best practices when deploying IBM Tivoli Business Systems Manager and IBM Tivoli Service Level Advisor for business service management.
Tivoli Service Level Advisor demo	http://www-306.ibm.com/software/tivoli/library/demos/service-level-advisor.html	IBM Tivoli Service Level Advisor Flash demo.

14.4 On Demand Business case studies and examples

In the following links, you will find numerous success stories of On Demand Business. These On Demand Business case studies and examples are organized by the client priorities and areas. Each example covers the business need, key challenges, solution and results:

<http://www-306.ibm.com/e-business/ondemand/us/sitemap/sitemap2.shtml>

You can also use the following link, if you choose to study the case studies based on industry:

http://www-306.ibm.com/software/success/cssdb.nsf/CategoryL1ViewFM?ReadForm&Site=wp_industryL1VW

By the name of the client:

<http://www-306.ibm.com/software/success/cssdb.nsf/customerVW?OpenView&Count=10&RestrictToCategory=wp>

By date:

<http://www-306.ibm.com/software/success/cssdb.nsf/lateststoriesVW?OpenView&Count=10&RestrictToCategory=wp>

By the name of the business partner:

<http://www-306.ibm.com/software/success/cssdb.nsf/partnerVW?OpenView&Count=10&RestrictToCategory=wp>

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this Redbook. For an a more comprehensive list of related publications and resources, see Chapter 14, “Resources and tools for On Demand Business solution design” on page 261

IBM Redbooks and other publications

For information on ordering these publications, see “How to get IBM Redbooks” on page 306. Note that some of the documents referenced here may be available in softcopy only.

- ▶ *BPEL4WS Business Processes with WebSphere Business Integration: Understanding, Modeling, Migrating*, SG24-6381
- ▶ *Developing Workflows and Automation Packages for IBM Tivoli Intelligent Orchestrator*, SG24-6057
- ▶ *Enterprise Security Architecture Using IBM Tivoli Security Solutions*, SG24-6014
- ▶ *Federated Identity Management with IBM Tivoli Security Solutions*, SG24-6394
- ▶ *Getting Starting on Integrating Your Information*, SG24-6892
- ▶ *High Availability Scenarios with IBM Tivoli Workload Scheduler and IBM Tivoli Framework*, SG24-6632
- ▶ *IBM Workplace Collaboration Services and Domino Together Integration Handbook*, SG24-6484
- ▶ *On Demand Operating Environment: Security Considerations in an Extended Enterprise*, REDP3928
- ▶ *Patterns: Implementing an SOA using Enterprise Service Bus*, SG24-6346
- ▶ *Patterns: Serial Process Flows for Intra- and Inter-enterprise*, SG24-6305
- ▶ *Patterns: SOA with an Enterprise Service Bus in WebSphere Application Server V6*, SG24-6494
- ▶ *A Portal Composite Pattern Using WebSphere V4.1*, SG24-6869
- ▶ *Portal Composite Pattern Using IBM WebSphere Portal V5*, SG24-6087
- ▶ *Portalizing Domino Applications: Integration with Portal 5.02 and Lotus Workplace 2.0.1*, SG24-6466
- ▶ *Selling Solutions for On Demand Business*, SG24-6330
- ▶ *Tivoli Business Systems Manager V2.1 End-to-end Business Impact Management*, SG24-6610
- ▶ *WebSphere Business Integration Server Express The Express Route to Business Integration*, SG24-6353
- ▶ *WebSphere Portal Server and DB2 Information Integrator: A Synergistic Solution*, SG24-6433

Other publications

These publications are also relevant as further information sources:

- ▶ *Availability Management Solutions Buyer's Guide: Purchasing Criteria*, G507-1120
- ▶ *IBM Workplace Collaboration Services Overview: Providing Fully Integrated Collaborative Capabilities for the IBM Workplace Environment*, G224-7333
- ▶ *IBM Workplace Collaboration Services: Unifying People, Tools and Resources to Simplify Day-to-day Business*, G325-2453
- ▶ *IBM Workplace, WebSphere Portal and Lotus Software Product Portfolio Guide*, G325-2068
- ▶ *Leverage Best Practices When Deploying IBM Tivoli Business Systems Manager and IBM Tivoli Service Level Advisor for Business Service Management*, G507-1082
- ▶ *Rapid Application Development with Rational and WebSphere Studio*, G325-1122
- ▶ Cutlip, *Integrated Solutions with DB2*, Prentice Hall Professional Technical Reference, 2003, ISBN 0201754851
- ▶ Fellenstein, *On Demand Computing: Technologies and Strategies*, Prentice Hall Professional Technical Reference, 2004, ISBN 0131440241
- ▶ Hoskins, *Conquering Information Chaos in the Growing Business: IBM Solutions for Managing Information in an on Demand World*, Maximum Press, 2005, ISBN 1931644330
- ▶ Hoskins, *IBM On Demand Technology for the Growing Business: How to Optimize Your Computing Environment for Today and Tomorrow*, Maximum Press, 2005, ISBN 1931644322
- ▶ Hoskins, *IBM On Demand Technology Made Simple: Understanding the On Demand Business Strategy and Underlying Products*, Maximum Press, 2005, ISBN 1931644276
- ▶ Joseph, et al, *Grid Computing*, Prentice Hall Professional Technical Reference, 2003, ISBN 0131456601
- ▶ Lamb, et al, *IBM WebSphere and Lotus: Implementing Collaborative Solutions*, Pearson Education, 2004, ISBN 0131443305
- ▶ Murch, *Autonomic Computing*, Prentice Hall Professional Technical Reference, 2004, ISBN 013144025X
- ▶ Ould, *Business Process Management: A Rigorous Approach*, Meghan-Kiffer Press, 2005, ISBN 0929652274

Online resources

These Web sites and URLs are also relevant as further information sources:

- ▶ Architecting on demand solutions, Part 2: Use the Enterprise Service Bus to connect disparate applications
<http://www-106.ibm.com/developerworks/library/i-odoebp2>
- ▶ Automation Assessment Tool Preview
<http://www-306.ibm.com/software/tivoli/resource-center/overall/dem-auto-tool.jsp>
- ▶ *An autonomic computing roadmap*, found at:
<http://www-128.ibm.com/developerworks/autonomic/library/ac-roadmap/>

- ▶ Best practices for Web services: Part 1, Back to the basics
<http://www-128.ibm.com/developerworks/webservices/library/ws-best1>
- ▶ Best Practices for Web services, Part 12: Web services security, Part 2
<http://www-128.ibm.com/developerworks/webservices/library/ws-best12>
- ▶ BPMI.org: About Us
<http://bpmi.org/aboutus.htm>
- ▶ *Business Process Integration, One Step at a Time*, found at:
<http://www.bptrends.com/publicationfiles/03%2D04%20ART%20BPI%200ne%20Pie%20At%20A%20Ti%20me%20%2D%20Deshpande%2Epdf>
- ▶ *C4ISR Architecture Framework Version 2.0*, found at:
<http://www.afcea.org/education/courses/archfwk2.pdf>
- ▶ Competitive Advisor - Selling resources
http://www-1.ibm.com/partnerworld/pwhome.nsf/weblook/sel_spt_compadv_desc.html
- ▶ developerWorks: Sample IT projects: Architecting on demand solutions
<http://www-106.ibm.com/developerworks/library/i-odoebp.html>
- ▶ developerWorks: SOA and Web services
<http://www-130.ibm.com/developerworks/webservices>
- ▶ developerWorks: Tivoli
<http://www-136.ibm.com/developerworks/tivoli>
- ▶ egov: The Official Web Site of the President's E-Government Initiative
<http://www.whitehouse.gov/omb/egov/>
- ▶ ESB - Enterprise Service Bus
<http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=landings/esbbenefits>
- ▶ *Federal Enterprise Architecture Framework Version 1.1*, found at:
https://secure.cio.noaa.gov/hpcc/docita/files/federal_enterprise_arch_framework.pdf
- ▶ How they did it: On Demand Business success stories
http://www-306.ibm.com/e-business/ondemand/us/overview/howtheydidit/howtheydidit_flat.shtml
- ▶ IBM - Application hosting - United States
http://www-1.ibm.com/businesscenter/smb/us/en/contenttemplate/gcl_xmliid/13688
- ▶ IBM Biopharmaceutical Solution, a Qualified mySAP All-in-One Solution - Summary
<http://www-1.ibm.com/services/us/index.wss/summary/imc/a1003025>
- ▶ IBM Corporate Information Asset Manager for Life Sciences
<http://www-1.ibm.com/industries/healthcare/doc/content/resource/technical/1170458105.html>
- ▶ IBM - CRM and Contact Center
<http://www-1.ibm.com/industries/telecom/doc/jsp/indseg/crm>
- ▶ IBM Deep Computing - Capacity on Demand
<http://www-1.ibm.com/servers/deepcomputing/cod.html>
- ▶ IBM DR550: Overview - IBM TotalStorage Disk Storage Systems
<http://www-1.ibm.com/servers/storage/disk/dr/index.html>

- ▶ IBM Ease of Use - User Engineering
http://www-306.ibm.com/ibm/easy/eou_ext.nsf/publish/1996
- ▶ IBM Engineering & Technology Services
<http://www-03.ibm.com/technology/index.shtml>
- ▶ IBM @server - IBM Virtualization Engine
<http://www-1.ibm.com/servers/eserver/about/virtualization/index.html?ca=vedemot&met=web&>
- ▶ IBM @server - Server consolidation - What's Unique about the TCOnow! Approach
<http://www-1.ibm.com/servers/solutions/serverconsolidation/tco/approach.html>
- ▶ IBM @server - Software Information Center
http://publib.boulder.ibm.com/infocenter/eserver/v1r1/en_US/index.htm?info/veinfo/planner.htm
- ▶ IBM Financing for Open Infrastructure Offerings
<http://www-1.ibm.com/financing/us/ondemand/offerings/oio.html>
- ▶ IBM Global Services - Application development
<http://www-1.ibm.com/services/us/index.wss/offering/bcs/a1002462>
- ▶ IBM Global Services - Application Hosting for Siebel - Web services (Siebel CRM OnDemand):
<http://www-1.ibm.com/services/us/index.wss/offering/ebhs/a1001405>
- ▶ IBM Global Services - Application management services
<http://www-1.ibm.com/services/us/index.wss/itservice/ams/a1000410>
- ▶ IBM Global Services - Consulting
<http://www-1.ibm.com/services/us/index.wss/home/consulting>
- ▶ IBM Global Services - Customer experience, branding and usability
<http://www-1.ibm.com/services/us/index.wss/offering/bcs/a1000302>
- ▶ IBM Global Services - Customer relationship management
http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005261
- ▶ IBM Global Services - Financial management
http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005262
- ▶ IBM Global Services - Human capital management
http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005263
- ▶ IBM Global Services - IBM On Demand Workplace
http://www-1.ibm.com/services/us/index.wss/offerfamily_services/igs/a1001733
- ▶ IBM Global Services - Increase business innovation
<http://www-1.ibm.com/services/us/index.wss/businesstopic/bcs/a1000401>
- ▶ IBM Global Services - Issues
<http://www-1.ibm.com/services/us/index.wss/home/topics>
- ▶ IBM Global Services - IT Infrastructure Planning and Design for On Demand Business - Infrastructure services readiness engagements
<http://www-1.ibm.com/services/us/index.wss/offering/its/a1004757>
- ▶ IBM Global Services - ITS Communities of Practice Web site
<http://community.usca.ibm.com/igscommunities/Wiki.jsp?page=December162004ComponentBusinessModelingForIT>

- ▶ IBM Global Services - IT services
<http://www-1.ibm.com/services/us/index.wss/home/services>
- ▶ IBM Global Services - IT Systems Management Services for Security - integrated identity and access management
<http://www-1.ibm.com/services/us/index.wss/offering/its/a1004897>
- ▶ IBM Global Services - Security and privacy
<http://www-1.ibm.com/services/us/index.wss/itservice/bcs/a1000405>
- ▶ IBM Global Services - Service-oriented architecture
<http://www-1.ibm.com/services/us/index.wss/itservice/its/a1002583>
- ▶ IBM Global Services - Supply chain management
http://www-1.ibm.com/services/us/index.wss/bus_serv/bcs/a1005268
- ▶ IBM Global Services - Workforce mobility service
<http://www-1.ibm.com/services/us/index.wss/offering/ebhs/a1001825>
- ▶ IBM Global Solutions Directory
<http://www.developer.ibm.com/solutions/isv/igssg.nsf/AllSolutionsbyID/86256B7B0003EBBF86>
- ▶ IBM Grid Computing home page
<http://www.ibm.com/grid>
- ▶ IBM Grid Computing - IBM and grid - Products and services
http://www-1.ibm.com/grid/about_grid/ibm_grid/products_services.shtml
- ▶ IBM Grid Computing Solutions - business analytics
http://www-1.ibm.com/grid/solutions/by_business/bus_analytics.shtml
- ▶ IBM - How to get started with On Demand Business
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The Solution Designer's Guide to IBM On Demand Business Solutions

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The Solution Designer's Guide to IBM On Demand Business Solutions

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